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TWO NEW ASCLEPIADS FROM SZECHUAN, CHINA[1]

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Tylophora minutiflora Woodson, sp. nov., fruticosa volubilis altitudine ignota; ramulis teretibus juventate sparse puberulis mox glabratis maturitate cortice brunneis inconspicue lenticellatis; foliis oppositis petiolatis elliptico-lanceolatis apice acutis acuminatisve basi obtusis 3.0–4.5 cm. longis 0.7–1.8 cm. latis membranaceis post exsiccationem inconspicue bullatis caeterumque glabris; petiolis 0.3–0.5 cm. longis glabris; inflorescentiis lateralibus cymosis foliis multo brevioribus pauciflоris; pedunculo petiolos duplo vel triplo superante sparse minutissimeque puberulo; pedicellis 0.25–0.3 cm. longis ut in pedunculo vestitis; bracteis lanceolatis ca. 0.1 cm. longis; calycis laciniis ovatis fere obtusis 0.15 cm. longis extus minute pilosulis intus basi in marginibus squamellas 4–5 gerentibus; corollae rotatae luteo-viridis extus intusque glabrae tubo vix manifesto basi ca. 0.075 cm. diametro metiente, lobis ovatis obtusis cum tubo ca. 0.35 cm. longis patulis; gynostegio ca. 0.18 cm. longo; antheris oblongo-sagittatis anguste obscurissimeque auriculatis apice obtusis hyalinis ca. 0.11 cm. longis coronae segmentum unciforme ca. 0.025 cm. longum leviter inflexum dorso ad insertionem filamenti quoque gerentibus; pollinibus ovoideis minutissime polyconvexis ca. 0.01 cm. longis; caudiculis brevissimis; retinaculo compresse obovoideo-sagittato

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vix 0.01 cm. aequante; ovario glabro ca. 0.1 cm. alto; stigmate obovoideo inconspicue bullato apice paululo bipartito ca. 0.07 cm. longo extra antheras conspicuissime exserto viridulo; folliculis ignotis.—CHINA: SZECHUAN: O-pien Hsien, alt. 900 m., mountain slope along roadside, May 15, 1932, *T. T. Yü 745* (Herb. Arnold Arboretum, TYPE, Herb. Missouri Bot. Garden, analytical drawings).

The inflorescence of this species recalls that of *T. fasciculata* Ham. in general construction, but the flowers of the latter are somewhat larger, the corona segments globular, and the stigma,

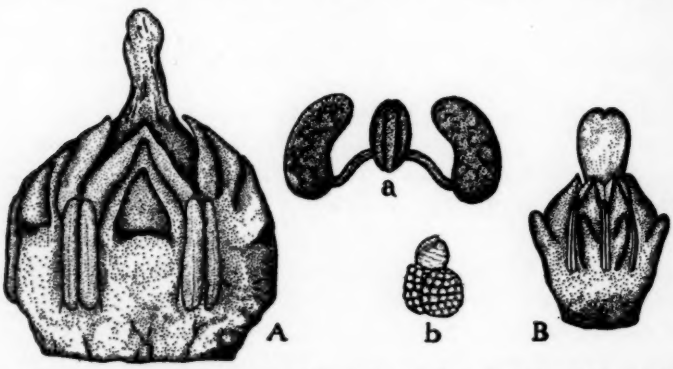

Fig. 1. A, gynostegium (x 8½), and a, pollinia (x 30), of *Marsdenia carnea* Woods.; B, gynostegium (x 20), and b, pollinia (x 92), of *Tylophora minutiflora* Woods.

although exserted beyond the anther-tips, does not attain such extreme development. Apparently *T. minutiflora* is most closely allied to *T. pseudotenerrima* Pitard, of French Indo-China, which I know only from the rather meagre original diagnosis. The latter species seems to differ in having linear or linear-lanceolate leaves 4.0–9.5 cm. long and only 0.5–1.1 cm. broad with a distinct marginal vein, while the calyx-lobes are described as acute, and the corolla as pubescent within. The description of the corona segments pronounces them "gibbous," as in *T. minutiflora,* but relative dimensions are not given. The stigma of *T. pseudotenerrima* has not been de-

scribed, and the aspect and dimensions of the other components of the gynostegium, including the pollinia, likewise have been neglected.

Marsdenia carnea Woodson, sp. nov., suffruticosa volubilis altitudine ignota; ramulis teretibus post exsiccationem longitudinaliter striatis juventate leviter pilosulis maturitate glabratis cortice olivaceis; foliis oppositis longiuscule petiolatis ellipticis apice fere subcaudato-acuminatis basi acutis saepe fere attenuatis 6–12 cm. longis 1.5–4.0 cm. latis coriaceis post exsiccationem olivaceis supra juventate sparse pilosulis maturitate glabratis nervo medio venisque minute scaberulis subtus minutissime velutino-papillatis; petiolis 1.5–2.0 cm. longis minute puberulis; inflorescentiis lateralibus alternatis umbellato-cymosis paucifloris; pedunculo leviter puberulo petiolos paulo superante; pedicellis 0.9–1.0 cm. longis ut in pedunculo vestitis; calycis laciniis late ovatis obtusis 0.2–0.25 cm. longis extus pilosulis intus basi squamellam parvam gerentibus; corollae urceolato-campanulatae carneae tubo 0.7 cm. longo basi ca. 0.5 cm. diametro metiente extus glabro intus minute puberulo; lobis late ovatis obtusis rotundatisve ca. 0.2 cm. longis leviter recurvatis; gynostegio ca. 0.6 cm. longo; antheris late oblongo-sagittatis apice anguste acutis ca. 0.3 cm. longis dorso paululo supra medium coronae segmentum triangulare acuminatum ca. 0.07 cm. longum quoque gerentibus; pollinibus oblongoideo-reniformibus leviter inflexis ca. 0.05 cm. longis; caudiculis pollinia subaequantibus; retinaculo late oblongo-sagittato ca. 0.02 cm. longo; ovario glabro ca. 0.1 cm. longo; stigmate conico apice anguste obtuso inconspicue bipartito conspicue exserto antheras ca. bis superante; folliculis ignotis.—CHINA: SZECHUAN: twining on shrub, Mt. Omei, alt. 1770 m., July 9, 1931, *F. T. Wang 23275* (Herb. Missouri Bot. Garden, TYPE).

Closely related to *M. Calesiana* Wight, which is characterized by cordate foliage, much-branched cymes, and corollas which are pubescent externally.

NEW OR OTHERWISE NOTEWORTHY APOCYNACEAE OF TROPICAL AMERICA. IV[1]

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Temnadenia stenantha Woodson, sp. nov., fruticosa volubilis altitudine ignota; ramulis crassiusculis juventate minute ferrugineo-tomentulosis maturitate glabratis et inconspicue lenticellatis; foliis oppositis longe petiolatis oblongo-ellipticis apice breviter acuminatis basi late obtusis 11–13 cm. longis 4.5–5.0 cm. latis rigide membranaceis subcoriaceisve supra glabris subtus basi inconspicue minuteque puberulis caeterumque glabris; petiolis 1.7–1.9 cm. longis minute ferrugineo-puberulis; inflorescentiis lateralibus alternatis trichotome bostrycino-racemosis foliis paulo brevioribus vel subaequantibus floras 20–25 mediocres fulvas gerentibus; pedunculo di-trichotomo minute irregulariterque ferrugineo-tomentuloso; pedicellis 1.0–1.25 cm. longis post maturitatem paulo accrescentibus minute ferrugineo-puberulis; bracteis minute lanceolatis acuminatis 0.1–0.3 cm. longis paululo foliaceis; calycis laciniis ovato-lanceolatis acutis acuminatisve prope basem connatis 0.35–0.525 cm. longis plus minusve foliaceis extus minute ferrugineque puberulo-papillatis intus glabris squamellam obscure bifidem basi gerentibus; corollae salverformis tubo 2.5–2.7 cm. longo basi ca. 0.2–0.25 cm. diametro metiente prope apicem paululo gradatim dilatato extus minute ferrugineque puberulo-papillato intus prope insertionem staminum minute villosulo caeterumque glabro lobis oblique obovato-oblongis rotundatis ascendentibus 1.0–1.1 cm. longis; antheris omnino inclusis elliptico-sagittatis acuminatis auriculis angustissimis 0.7–0.75 cm. longis dorso dense villosulo-barbatis; ovario oblongoideo apocarpo ca. 0.15 cm. longo omnino glaberrimo; stigmate fusiformi-subcapitato apice obscure obtuseque bipartito ca. 0.15 cm. longo; nectariis com-

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presse oblongoideis ovarium paululo superantibus haud connatis; folliculis ignotis.—COLOMBIA: BOYACA: on edge of high forest, region of Mt. Chapon, alt. 7000 ft., June 17, 1932, *A. E. Lawrance 241* (Herb. New York Bot. Garden, TYPE, Herb. Missouri Bot. Garden, photograph and analytical drawings).

At first sight this plant was mistaken for a species of *Laubertia*, which it simulates superficially, particularly with regard to the mode of inflorescence, the shape of the corolla, and the minute ferruginous indument. The floral characters indicate an alliance with the technical requirements of *Temnadenia* which it is impossible to disregard.

Mr. Lawrance observes that this species is rare where found, in the mountainous region of extreme western Boyaca, at a distance of about one hundred miles northwest of Bogota. The flowers are reported as "bright yellow" and without odor. The vine is described by Lawrance as creeping upon the ground.

Macropharynx anomala Woodson, sp. nov., fruticosa volubilis altitudine ignota; ramulis crassiusculis minute denseque ferrugineo-tomentulosis tandem glabratis; foliis oppositis petiolatis late ovatis apice anguste breviterque subcaudato-acuminatis basi late obtusis vel rotundatis saepe subcordatis 10–18 cm. longis 5–9 cm. latis membranaceis supra irregulariter ferrugineque puberulo-papillatis subtus dense minutissimeque ferrugineo-tomentulosis; petiolis 2.5–3.0 cm. longis minute ferrugineo-tomentulosis; inflorescentiis lateralibus oppositis subumbellato-fasciculatis e cyma bostrycina 3-chotoma aperte derivatis paucifloris; pedunculis 1.0–2.5 cm. longis minute ferrugineo-tomentulosis pluribracteatis; bracteis linearibus 1.0–1.4 cm. longis minute pilosulis puberulo-papillatisve; pedicellis 0.15–0.23 cm. longis ut in pedunculo vestitis; calycis laciniis anguste elliptico-lanceolatis acuminatis 1.7–1.8 cm. longis foliaceis minutissime puberulo-papillatis intus basi squamellam deltoideam minute denticulatam gerentibus; corollae salverformis colore ignotae tubo (in alabastro) 1.4–1.6 cm. longo basi ca. 0.25 cm. diametro metiente prope insertionem staminum paulo inflato deinde prope orificem gradatim angustato extus intusque minute puberulo-

papillato lobis anguste ovato-dolabriformibus acuminatis 0.9–1.0 cm. longis; staminibus prope basem corollae insertis; antheris anguste sagittatis auriculis breviusculis acuminatis 0.7–0.72 cm. longis dorso minutissime papillatis glabratisve; ovario oblongoideo ca. 0.15 cm. longo glabro; stigmate subcapitato 0.15 cm. longo; nectariis compresse ovoideo-oblongoideis ovarium paulo superantibus; folliculis ignotis.—ECUADOR: in silv. tropic. fl. Pilaton, Oct., 1902, *A. Sodiro 107/16* (Herb. Berol., TYPE, Herb. Missouri Bot. Garden, photograph and analytical drawings).

The relegation of this species to *Macropharynx* is not completely without question. In aspect and position of the inflorescence, the single specimen resembles *Macropharynx spectabilis* (Stadelm.) Woodson, of which it is viewed tentatively as a congener. On the other hand, the inflorescences of *M. anomala* appear to have been derived from di- or trichotomous bostrychoid racemes such as occur in the typical species of *Temnadenia* having undergone great reduction. The pentamerous calyx and non-bracteate pedicels present arguments against the inclusion of the species within the monotypic *Macropharynx*.

Echites turbinata Woodson, sp. nov., fruticosa volubilis altitudine ignota; ramulis crassiusculis glabris maturitate conspicue lenticellatis; foliis oppositis petiolatis ellipticis apice acuminatis basi late obtusis 7.5–12.0 cm. longis 3.5–7.0 cm. latis firme membranaceis aperte paulo subsucculentis pallide viridibus omnino glabris; petiolis 0.8–1.3 cm. longis; stipulis intrapetiolaribus deltoideis subintegris; inflorescentiis lateralibus alternatis folia subaequantibus floras mediocres 8–10 gerentibus; pedunculo glabro; pedicellis 0.8–1.0 cm. longis glabris; bracteis ovato-lanceolatis 0.15–0.3 cm. longis; calycis laciniis ovatis longe acuminatis 0.3–0.32 cm. longis paulo foliaceis glabris intus basi squamellam deltoideam minutissime denticulatam gerentibus; corollae salverformis (colore ut creditur aut albidae aut gilvae) tubo 0.7 cm. longo basi ca. 0.15 cm. diametro metiente prope orificem paulo angustato extus intusque minute puberulo-papillato lobis anguste elliptico-

lanceolatis acuminatis 1.4–1.6 cm. longis turbinatis; antheris paululo exsertis anguste sagittatis 0.45 cm. longis glabris; stigmate fusiformi-subcapitato; ovario ovoideo minutissime pilosulo-papillato ca. 0.15 cm. longo; nectariis compresse oblongoideis ovario paulo brevioribus prope apicem inconspicue pilosulis; folliculis ignotis.—COSTA RICA: forets du Rancho Flores, Febr. 22, 1890, *A. Tonduz 2147* (Herb. Berol., TYPE, Herb. Missouri Bot. Garden, photograph and analytical drawings).

This species is most closely related to *E. Tuxtlensis* Standl., as is evidenced by the dichasial inflorescence, narrow corolla-lobes, and general aspect of the subsucculent foliage. The latter species differs, however, in the smaller corolla and leaves, and in the more ramified, more diffuse inflorescence with more slender branches. The type specimen of *E. turbinata* is of interest morphologically, since it indicates a transition from trichasial to dichasial mode of inflorescence in the upper branches. The same species is apparently represented by *Ørsted 15544* "in Monte Barba," Costa Rica, in the herbarium at Copenhagen.

Echites cincinnalis Woodson, sp. nov., suffruticosa volubilis altitudine ignota; ramulis graciliusculis minutissime sparsissimeque pilosulis; foliis oppositis breviter petiolatis ovato-ellipticis apice breviter acuminatis basi obscure cordatis vel latissime obtusis 4.5–8.0 cm. longis 2.0–4.5 cm. latis membranaceis utrinque glabris opacis dilute viridibus; petiolis 1.0–1.5 cm. longis; stipulis intrapetiolaribus haud visis; inflorescentiis lateralibus alternatis cincinnalibus simplicibus floras speciosas 8–14 gerentibus; pedunculo folios subaequante ut in ramulo vestito; pedicellis 0.8–0.9 cm. longis minutissime pilosulis; bracteis minute lanceolatis ca. 0.1 cm. longis caducis; calycis laciniis anguste lanceolatis paululo foliaceis 0.3–0.35 cm. longis acuminatis minute sparseque pilosulis intus basi squamellam deltoideo-ligulatam subintegram gerentibus; corollae salverformis tubo 3.5–3.75 cm. longo basi ca. 0.15 cm. diametro metiente usque ⅓ altitudinem angustato deinde abrupte dilatato ibique staminigero deinde prope fauces gradatim

angustato non contorto lobis oblique obovatis 1.8–2.0 cm. longis patulis margine sparse pilosulo-ciliatis; antheris ovato-lanceolatis acuminatis 0.75 cm. longis glabris omnino inclusis; stigmate fusiformi-subcapitato ca. 0.175 cm. longo; ovario oblongoideo ca. 0.15 cm. longo glabro; nectariis compresse obovoideis apice paululo emarginatis plus minusve connatis ovario ca. dimidio brevioribus; folliculis ignotis.—NICARAGUA: GRANADA: environs de Granada, alt. 40 m., autumn, 1869, *P. Lévy 1074* (Herb. Copenhagen, TYPE, Herb. Missouri Bot. Garden, photograph and analytical drawings).

This species is unique in the genus *Echites* because of its simple, cincinnal inflorescence, resembling that of the genus *Fernaldia,* and its inconspicuous indument. Its closest known relatives are apparently *E. turrigera* Woods., *E. elegantula* Woods., and *E. yucatanensis* Millsp.

Cufodontia arborea Woodson, sp. nov., arbor magna altitudine ignota; ramulis teretibus juventate plus minusve puberulis mox glabratis conspicue lenticellatis rimosis; foliis alternatis petiolatis late oblongo-ellipticis apice obtusis vel late acutis basi late obtusis 8.0–12.5 cm. longis 2.5–4.5 cm. latis subcoriaceis omnino glabris supra nitidulis subtus opacis venis secundariis subhorizontalibus utroque latere ca. 15–18; petiolis 1.0–1.2 cm. longis canaliculatis juventate ut in ramulo vestitis mox glabratis; cymis extra-axillaribus alternatis 7–9-floris dichotome divisis; pedunculo petiolos subaequante minute puberulo; pedicellis 0.35–0.4 cm. longis minute puberulis; tubo calycis cylindrico prope orificem paululo dilatato 0.6 cm. longo obtuse breviterque 2-labiato extus minute puberulo-papillato laciniis interioribus ovato-reniformibus obtusis apice minutissime acuminatis ciliatis; corollae dilute fulvae tubo cylindrico ca. 0.6–0.625 cm. longo basi ca. 0.175 cm. diametro metiente extus prope orificem puberulo-papillato intus villosulo lobis oblique oblongo-ellipticis acutis 0.9–0.95 cm. longis prope basem minute villosulis patulis; staminibus prope medium tubi corollae insertis filamentis ca. 0.05 cm. longis antheris ovoideis acuminatis ca. 0.15 cm. longis glabris omnino inclusis; ovariis ovoideis apocarpis ca. 0.1 cm. longis glabris; stylo ca. 0.2–0.225

cm. longo; stigmate cylindrico-subcapitato ca. 0.05 cm. longo; fructibus desiderantibus.—Mexico: oaxaca: vicinity of Cafetal Concordia, alt. 400–650 m., April 1–15, 1933, *C. V. Morton & E. Makrinius 2692* (U. S. Nat. Herb., type, photograph and analytical drawings, Herb. Missouri Bot. Garden).

The status of this peculiar genus is somewhat enlightened by Mr. Morton's collecting notes, which describe the plant as a "large tree with milky sap; corolla pale yellow." The other species of *Cufodontia, C. Stegomeris* and *C. Lundelliana,* have been classified by the collectors of the type specimen of either as shrubs. From both, *C. arborea* differs in the larger leaves and corolla. The corolla is puberulent without as in *C. Stegomeris.* Fruit is unknown for all three species.

Forsteronia portoricensis Woodson, sp. nov., fruticosa volubilis; ramulis sat crassiusculis glaberrimis vel juventate minutissime papillatis maturitate inconspicue lenticellatis; foliis oppositis breviter petiolatis oblongo-ellipticis rariusve ovalibus apice abrupte brevissime acuminatis non raro aut acutis aut obtusis basi late obtusis 3.2–9.0 cm. longis 1.3–4.7 cm. latis coriaceis margine post exsiccationem paululo revolutis venis secundariis arcuatis sat sparsis glaberrimis supra nitidulis subtus pallidioribus; petiolis 0.4–0.6 cm. longis; inflorescentiis corymboso-paniculatis terminalibus folia subaequantibus vel plus minusve manifeste brevioribus floras multas parvas coccineas rariusve carneas gerentibus; pedunculo minute puberulo-papillato vel glabriusculo; pedicellis 0.2–0.3 cm. longis papillatis rariusve minute sparseque puberulo-papillatis; bracteis ovatis 0.1–0.25 cm. longis scariaceis; calycis laciniis ovatis acutis vel obtusis 0.18–0.3 cm. longis scariaceis extus papillatis glabriusculisve squamellis alternatis 2–4; corollae tubo 0.15–0.2 cm. longo basi ca. 0.12–0.15 cm. diametro metiente faucibus ca. 0.18–0.2 cm. diametro metientibus extus glabris intus glabris vel indistinctissime papillatis lobis oblongo-ligulatis obtusis 0.4–0.5 cm. longis patulis extus intusque glabris margine non raro minute sparseque ciliolatis; filamentis staminum 0.3–0.32 cm. longis stylo agglutinatis antheris 0.25–0.3 cm. longis omnino exsertis glabris; ovario apocarpo ovoideo

ca. 0.07 cm. longo minute puberulo non raro glabriusculo; stigmate 0.1–0.13 cm. longo; stylo 0.25–0.3 cm. longo; nectariis ovarium subaequantibus; folliculis sat gracilibus flexuosis acuminatis reflexo-divaricatis plus minusve obfalcatis 14–19 cm. longis glabris; seminibus 0.9–1.0 cm. longis como dilute aurantiaco 1.8–2.0 cm. longo.—PORTO RICO: prope Humaco in fruticetis litoralibus ad "Candelero," Sept. 29, 1886, *P. Sintenis 5195* (Herb. Berol., TYPE, Herb. Missouri Bot. Garden, photograph and analytical drawings).

Apparently all specimens from Porto Rico previously determined as *F. corymbosa* (Jacq.) G. F. W. Meyer are referable to this species. *F. corymbosa, F. floribunda* (Sw.) G. F. W. Meyer, and *F. portoricensis* form a closely knit complex within the genus *Forsteronia.* Each is strictly endemic to a single island or island group of the Greater Antilles. A summary of the principal differences and similarities of the three species may conveniently be provided in parallel columns:

F. corymbosa	*F. portoricensis*	*F. floribunda*
Leaves obovate to broadly oval; *venation* broadly arcuate, relatively distant.	*Leaves* oblong-elliptic, rarely oval; *venation* broadly arcuate, relatively distant.	*Leaves* oblong-elliptic to oval; *venation* subhorizontal, dense.
Corolla deep red, rarely pale flesh-colored; *lobes* papillate within.	*Corolla* deep red; *lobes* glabrous within.	*Corolla* greenish-white; *lobes* glabrous within.
Follicles horizontal, stout, blunt, 11–14 cm. long.	*Follicles* reflexed-divaricate, more or less obfalcate, acuminate, 14–19 cm. long.	*Follicles* subparallel to tortuous or divaricate, flexuose, acuminate, 16–30 cm. long.
Plants of Cuba and Hispaniola.	*Plants* of Porto Rico.	*Plants* of Jamaica.

It is not always recognized by taxonomists that overlapping distinctions or criteria among species are biologically significant or worthy of note other than for the purposes of intended reduction to synonymy. The fact that related species are plexi of similar and dissimilar characters has consequently been

much neglected in the search for "diagnostic" characters for the bare purpose of easy identification. Therefore the position has been taken that, in spite of recognition that the characters enumerated above for *F. corymbosa, F. portoricensis,* and *F. floribunda* show a definite tendency of progression, or intergradation, from *F. corymbosa* to *F. floribunda,* or vice versa, through *F. portoricensis,* evidence is not thereby provided for the maintenance of one, rather than of three species. Nor does the existence of *F. portoricensis* impair the interpretation of *F. corymbosa* and *F. floribunda* as important biological entities. It may be argued with reason that geographical isolation has been responsible for the crystallization of the plexus into three closely related but patently distinct entities rather than into one rather loose and variable, larger group. Such is probably the case. At any event, is it not more than possible that the scrutiny of the relationships of such closely related botanical entities may contribute much to our understanding of the functions of organic evolution?

Forsteronia paludosa Woodson, sp. nov., suffruticosa volubilis; ramulis sat gracilibus glabris maturitate conspicue lenticellatis; foliis oppositis brevissime petiolatis anguste oblongo-lanceolatis breviter acuminatis vel acutis basi obtusis 5–7 cm. longis 1.3–1.6 cm. latis firmiter membranaceis vel subcoriaceis supra glabris nervo medio basi pauciglanduligero subtus in axillis nervi medii inconspicue barbellatis caeterumque glabris; petiolis 0.25–0.3 cm. longis glabris; inflorescentiis subspiciformi-paniculatis terminalibus folia subaequantibus floras plures parvas albidas gerentibus; pedunculo primario glabriusculo superne sparsissime irregulariterque pilosulo-papillato ultimo vix manifesto; pedicellis ca. 0.01–0.02 cm. longis minutissime puberulo-papillatis; bracteis minute ovatis 0.01–0.03 cm. longis scariaceis; calycis laciniis ovatis acutis 0.1–0.12 cm. longis minutissime puberulo-papillatis scariaceis eglanduligeris; corollae extus minutissime irregulariterque puberulo-papillatae tubo 0.1–0.12 cm. longo basi ca. 0.075 cm. diametro metiente faucibus ca. 0.125 cm. diametro metientibus intus minute villosulo lobis oblongis ca. 0.15 cm. longis intus

dense pilosulis patulis; filamentis staminalibus ca. 0.05 cm. longis distinctis stylo haud agglutinatis antheris subinclusis apice parum exsertis ca. 0.15 cm. longis minute barbellatis; ovario ovoideo apocarpo ca. 0.05 cm. longo minute papillato; stigmate ca. 0.12 cm. longo; nectariis ovario brevioribus; folliculis ignotis.—BRAZIL: PARA: locis paludosis, Campos de Cupijo, prope Cometa, July 22, 1916, *A. Ducke 21627* (Herb. Berol., TYPE, Herb. Missouri Bot. Garden, photograph and analytical drawings).

Well distinguished by its small, narrow foliage and subspiciform inflorescence. The eglandular calyx is a rarity in the genus.

Forsteronia simulans Woodson, sp. nov., fruticosa volubilis; ramulis sat crassiusculis glaberrimis maturitate inconspicue lenticellatis; foliis oppositis breviter petiolatis oblongo-ellipticis apice acutis basi obtusis vel plus minusve cuneatis 2–5 cm. longis 0.7–2.2 cm. latis coriaceis vel subcoriaceis omnino glaberrimis supra nervo medio pauciglanduligero subtus pallidioribus venis secundariis subhorizontalibus; petiolis 0.3–0.5 cm. longis; inflorescentiis dense corymboso-subumbellatis simplicibus (vel obscurissime compositis?) terminalibus folia subaequantibus floras numerosas virido-fulvidas gerentibus; pedunculo minute papillato; pedicellis 0.5–0.6 cm. longis minutissime papillatis; bracteis ovato-lanceolatis 0.15–0.3 cm. longis paululo foliaceis; calycis laciniis ovatis obtusis 0.15–0.2 cm. longis extus glabriusculis vel minutissime papillatis squamellis alternatis solitariis; corollae tubo ca. 0.25 cm. longo basi ca. 0.125 cm. diametro metiente faucibus ca. 0.15 cm. diametro metientibus extus glabro intus minute puberulo lobis ovatis obtusis ca. 0.2 cm. longis patulis extus intusque glabris margine minute sparseque ciliolatis; filamentis staminum ca. 0.15 cm. longis stylo agglutinatis antheris ca. 0.2 cm. longis omnino exsertis glabris; ovario apocarpo ovoideo ca. 0.06 cm. longo glabro; stigmate ca. 0.2 cm. longo; stylo ca. 0.2 cm. longo; nectariis ovarium subaequantibus; folliculis ignotis.—COLOMBIA: SANTANDER DEL NORTE: eastern slope of Paramo del Hatico, en route from Toledo to Pamplona, alt. 2300 m., edge

of woods, March 12, 1927, *E. P. Killip & A. C. Smith 20568* (U. S. Nat. Herb., TYPE, Herb. Missouri Bot. Garden, photograph and analytical drawings).

It is astonishing to find a plant as similar superficially as this plant is to *F. floribunda* of Jamaica, with as many striking morphological dissimilarities. The foliage of the two species appears strikingly similar with regard to general size and shape, texture, color, and venation. However, that of *F. simulans* is glandular at the base of the midrib, while that of *F. floribunda* is eglandular. The general aspect of the inflorescence of the species is also somewhat similar, and the color of the flowers is generally alike. But the inflorescence of *F. simulans* is evidently simple, or appears so upon dissection; that of *F. floribunda* is thyrsiform. That the evidently simple inflorescence of the former represents a reduction from a previous compound state appears plausible. One of the most striking characteristics of *F. simulans,* however, is found in the stigma, which is virtually umbraculiform as in the genus *Mandevilla,* which it resembles in this character more nearly than the other species of *Forsteronia* with relatively simple, fusiform or subcapitate stigmata. The species, in short, appears to be of unusual phylogenetic interest.

Forsteronia Velloziana (A. DC.) Woodson, comb. nov.

Echites bracteata Vell. Fl. Flum. 112. 1830; Icon. **3**: *pl. 41.* 1827, not HBK.

Echites Velloziana A. DC. in DC. Prodr. **8**: 474. 1844.

Forsteronia multinervia A. DC. γ. *microphylla* Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 105. 1860.

Forsteronia ? bracteata (Vell.) Muell.-Arg. loc. cit. 106. 1860.

Thyrsanthus bracteatus (Vell.) Miers, Apoc. So. Am. 102. 1878.

Forsteronia microphylla (Muell.-Arg.) Hand.-Mzt. Denkschr. Akad. Wiss. Wien **79**: 388. 1931 (reprint, 12. 1910).

An unmistakable and rather frequently collected element of the southern Brazilian flora. There can be little question that this entity is entitled to full specific rank. Its brushy, sub-

corymbose inflorescence, virtually erect corolla-lobes, vegetative indument, and short, rigid follicles are quite uniform throughout a wide series of specimens examined during the course of a revision of *Forsteronia* in manuscript.

Prestonia Meg'agros (Vell.) Woodson, comb. nov.

Echites Meg'agros Vell. Fl. Flum. 110. 1830; Icon. **3**: *pl. 33*. 1827.

Haemadictyon megalagrion Muell.-Arg. in Mart. Fl. Bras. **6**[1]: 170. 1860.

Prestonia megalagrion (Muell.-Arg.) Miers, Apoc. So. Am. 149. 1878.

It appears necessary to restore the original spelling of this species, illegitimately altered by Mueller.

HYMENOGASTER AND RELATED GENERA[1]

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In continuation of our studies on the Hymenogasteraceae *(sensu latiore)* we here present the genera belonging to that family in the restricted sense used by Dodge[2]: *Hymenogaster, Richoniella, Dendrogaster,* and *Gautieria. Dendrogaster* and *Gautieria* seem closely related to *Hymenogaster,* although often placed in the Hysterangiaceae on account of the greater development of sterile tissues (columella) in the gleba. In separating these genera, spore characters have been given precedence over the presence or absence of peridium, *Gautieria* being restricted to species with conspicuously striate or longitudinally ribbed spores and *Dendrogaster* to those with a well-developed columella and some species also with a very highly developed utricle. *Dendrogaster* may be separated from the species of *Hymenogaster* by the presence of a columella. *Richoniella (Nigropogon)* has been segregated from *Hymenogaster* largely on the peculiar shape of its spores.

As in our previous work, Ridgway ('Color Standards and Color Nomenclature,' Washington, 1912) has been used as a standard for color descriptions of dried and alcoholic specimens, and such field notes as were available for fresh material, rarely based on any standard. In citing specimens examined the general plan adopted in our previous taxonomic papers, of

[1] Published as Technical Paper No. 226, with the approval of the Director of the Oregon Agricultural Experiment Station. Contribution from the Department of Botany in cooperation with the Henry Shaw School of Botany of Washington University.

[2] Gaumann, E. A., and C. W. Dodge. Comparative morphology of fungi, 701 pp. McGraw Hill Book Co. New York, 1928. (See pp. 488–491.)

Issued December 12, 1934.

giving the data accompanying the specimens, has been followed. In the interest of economy of space, the following designations of important collections of hypogaeous fungi have been used. Where duplicates occur in our private herbaria we have refrained from citing them unless it became necessary on account of mixtures of species under the same collector's number (e. g., a number sent us by H. E. Parks was found to differ from that same number in the herbarium at the University of California).

Berlin — Miscellaneous collections in the K. Botanisches Museum zu Berlin-Dahlem.

Brit. Mus. — Herbaria of Broome and Ravenel, and some other collections at the British Museum of Natural History, South Kensington, London, England.

Dodge — Private herbarium of C. W. Dodge contains many specimens sent in for determination.

Farlow — Herbaria of Bucholtz, Hoehnel, Patouillard, and Thaxter, and also many sets of exsiccati and miscellaneous collections at Harvard University.

Hesse — Hesse Herb. at Botanische Institut, University of Marburg.

Kew — Berkeley Herb., especially rich in Broome, Vittadini, and E. Fries specimens, Cooke Herb. and a few other collections from Rodway and others, at the Herbarium of the Royal Botanic Gardens, Kew, Surrey, England.

Lloyd Mus. — Lloyd collections now in the custody of the Smithsonian Institution of Washington, D. C., formerly in the Lloyd Museum of Cincinnati. These specimens are cited under their numbers at the time of our visits, 1917 and 1923. Since then all the specimens have been given accession numbers which are much more convenient and less ambiguous, but we have not had an opportunity to examine them in their new location.

Oregon State	Herbarium of the Oregon State Agricultural College, at Corvallis, rich in miscellaneous collections from Oregon.
Paris	Tulasne Herb. and some miscellaneous collections in the Laboratoire de Cryptogamie, Muséum d'Histoire Naturelle, in Paris.
Soehner	Private herbarium of Ert Soehner, München, duplicates of many numbers in Berlin and in Dodge Herb.
Stanford	Harkness collections in the Dudley Herbarium of the Leland Stanford Jr. Univ., at Palo Alto, California. Since all the alcoholic material from the herbarium of H. W. Harkness at the California Academy of Sciences in San Francisco was destroyed in the fire of 1906, our knowledge of Harkness' species must be based upon these cotypes. There are also valuable collections by J. McMurphy and others here.
Univ. Cal.	Herbarium of the University of California, especially rich in collections of N. L. Gardner, and more recently of H. E. Parks.
Univ. N. Car.	Herbarium of the University of North Carolina, rich in collections of W. C. Coker and J. N. Couch.
Upsala	Th. M. Fries and Th. C. E. Fries collections and series of specimens sent to E. Fries, especially from Quélet, Czernaiev, Vittadini, and G. Bresadola, now in the herbarium of the Botaniska Trädgård at Upsala University.
Zeller	Private herbarium of S. M. Zeller, containing Pacific Coast material and many collections sent in for determination.

We gratefully acknowledge those who have made this work possible by putting at our disposal either personal collections or the facilities of libraries and herbaria mentioned above; also Dr. J. B. Cleland, for Australian material, Dr. G. H. Cun-

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HYMENOGASTER

Hymenogaster Vittadini, Monogr. Tuberac. 20–25. 1831; Endlicher, Gen. Pl. 30. 1836; Corda, Anleit. z. Stud. Myc. lxxxii, 108. 1842; Icones Fung. **5**: 26. 1842; Tulasne, Ann. Sci. Nat. Bot. II. **19**: 373–375. 1843; Giorn. Bot. Ital. **1**[2]: 55. 1844; Fung. Hypog. 63–74. 1851; Rabenhorst, Deutschl. Krypt.-Fl. **1**: 250–251. 1844; Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **13**: 346–350. 1844; **18**: 73–76. 1846; Fries, Summa Veg. Scand. 436. 1849; Berkeley, Outlines Brit. Fungol. 295–297. 1860; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 874–877. 1883; DeToni in Sacc. Syll. Fung. **7**:168–175. 1888; Hesse, Hypog. Deutschl. **1**:110–133. 1891; Harkness, Proc. Cal. Acad. Sci. Bot. III. **1**:245–251. 1899; E. Fischer in Engler & Prantl, Die Nat. Pflanzenfam. I. **1****: 308-310. 1899; Bucholtz, Материалы къ морфологіи и систематикѣ подземныхъ грибовъ... Издвн. Естеств. Ист. Музея Графини Е. П. Шереметевой въ С. Михайловскомъ Московской губ. **1**: 154–160. 1902 [often cited as Beitr. Morph. Syst. Hypog.]; Bull. Soc. Imp. Nat. Moscou **21**: 470–484. 1908; Soehner, Hedwigia **64**: 192–202. 1923.

Pyrisperma Rafinesque, Med. Repository II. Hex. **5**: 355. 1808 *(nomen nudum)*; Desvaux, Jour. de Bot. **2**: 177. 1809; Lloyd, Myc. Notes 13: 130. 1903.—*Pyrispora* Endlicher, Gen. Pl. 30. 1836 *(nomen nudum)*.

Hymenangium Klotzsch in Dietrich, Fl. Reg. Boruss. [Fl. Königr. Preuss.] **7**: no.466. 1839—*not Hymenangium* Klotzsch, *Ibid.* **6**: no. 382. 1838; Corda, Anleit. z. Stud. Myc. lxxxiii, 114. 1842; Icones Fung. **5**: 28. 1842 (in part).

Splanchnomyces Corda emend. Zobel in Corda, Icones Fung. **6**: 36–45. 1854 (in part).

The type species of the genus is considered to be *Hymenogaster Bulliardi* Vittadini. In the absence of international rules for determining the type species of a genus, the rules drawn up by the Committee on Nomenclature of the Botanical Society of America (Bot. Soc. Am. Publ. 73: 70–71. 1919) are taken as the best guide available. None of the rules apply; neither does Article 7 a, c, and d of the recommendations. The last clause of Article 7e would point to *Hymenogaster Bulliardi* Vittadini, since that is unquestionably the oldest concept of the group historically. Article 7f would also point to *H. Bulliardi*, since Corda (Anleit. z. Stud. Myc. 108. 1842) so designated this species. However, Article 7b and 7g both suggest *H. citrinus* Vittadini, since the author mentions its occurrence as "frequentissimus," while that of other species is but "frequens" or "rarus." Were the genus *Hymenogaster* to be subdivided it appears extremely improbable that *H. citrinus* and *H. Bulliardi* would be found in different groups, since they seem to be much more nearly related than many of the other species; hence the first two clauses of 7e do not affect the decision. And finally, *H. citrinus* is the first in the genus, if these two species are considered to be otherwise of equal eligibility.

Fructifications subspherical, reniform, pyriform, or irregular; fibrils rarely present, then merely basal leading to rhizomorphs; peridium usually simple, prosenchymatous, pseudoparenchymatous, or stupose, usually confluent with the septa of the gleba, indehiscent; gleba colored as the spores, lacunose, chambers empty, then partially filled with spores, irregular or more or less radiating from a sterile base; septa usually of the same structure as the peridium, relatively thin, often very fragile when dry; sterile base usually present, especially more prominent in young specimens, pulvinate to

conical; basidia 1–4-spored; spores colored, usually some shade of brown, ochre, or almost black at maturity, ovoid, obovoid, ellipsoid, citriform, fusiform, or lanceolate, with or without apiculus, with or without persistent pedicel, surface smooth to verrucose, rugose, alveolate, or reticulate, with or without a more or less wrinkled utricle.

The peridium and tramal tissues of the gleba are little differentiated in the young stages. In some species they never undergo further differentiation, while in others the outer hyphae become larger and form a coarse stupose outer layer which gradually merges into the gleba. The cavities develop schizogenetically in the upper portion of the fructification, leaving a large more or less hemispherical to conical sterile base which persists for a long time, occasionally to maturity. As the cavities expand above, the lower ones next the sterile base are stretched longitudinally so that they appear to radiate from the sterile base. The septa are very broad at first and gradually shrink until they are very thin, often fragile, occasionally scissile. The subhymenium is often pseudoparenchymatous, the basidia are usually cylindrical and so evanescent that they are rarely observable in mature fructifications. On drying, the tissues throughout the fructification collapse, and thus measurements based on dry material are many times less than those based on fresh specimens or on those preserved in alcohol. When a fructification has been preserved in alcohol for a time and then allowed to dry out, the tissues are *still more* collapsed and it is almost impossible to distinguish structures. Since most of the material available in this work has been dried, unless otherwise noted the measurements and the structures observable in the dry material have been given in our descriptions and keys. One who intends to prepare herbarium material of this genus should make careful field notes of color, odor, and size, and preserve most of the material in alcohol or alcohol to which 10 per cent glycerol has been added, drying one fructification in order to compare with dry material to be found in other herbaria. Exceptionally fine material received from Prof. James McMurphy, Stanford University, was pre-

served in a mixture of 900 cc. of 50 per cent alcohol, 50 cc. of 40 per cent formalin, 25 cc. of glycerine, and 25 cc. of glacial acetic acid. It is sometimes advantageous to kill immediately in formal-acetic-alcohol, which may be used as a preservative as well as a mordant. Such material may be imbedded for histological purposes or studied by free-hand or freezing-microtome sectioning.

The geographical distribution of *Hymenogaster* is similar to that of the larger genera so far studied except *Melanogaster*. The European flora has been the most thoroughly studied by a long line of investigators and collectors. At present fifty-nine species are reported although it seems likely that some may be synonyms, as some of the types of Hesse's species and the type of *H. rufus* have been unavailable. The Pacific flora, from Japan, Oregon, California, Chile, and Australasia, where collection and study are more sporadic, is represented by twenty-nine species. In Oregon and California, besides the species common to Australasia and a few not known from other regions, there are several European species represented, most of these also found in eastern North America. Only one of the European species has been found in South America and none in Australasia. The Australasian species are small-spored, except *H. fusisporus,* where the epispore is often finely verrucose, not coarsely so as in the *H. tener* and the *H. muticus* group of Europe. *Hymenogaster zeylanicus,* so far as known endemic in the mountains of Ceylon, seems more closely related to the Australasian group, although superficially it also resembles *H. cerebellum* of northern Italy.

In the descriptions of the spores, the measurements have included the utricle and other spore markings unless otherwise stated. The utricle is a more or less loosely applied membranous envelope, which may be smooth or variously wrinkled. This where present is in addition to the epispore which may be smooth, variously verrucose, rugose, alveolate, or reticulate. The thickness of the epispore may not be apparent in optical section. There is considerable variation in the shape of the citriform spores. In our descriptions we have used the terms

ellipsoid-citriform, ovoid-citriform, or obovoid-citriform when the short diameter of the spore is at, below, or above the middle of the long diameter. In many species the shape appears variable in a given fructification, due to the presence of immature spores. In the following descriptions, mature spores have been assumed to be those with the darkest color although they may not be the largest. The very young spore still attached to the basidium is usually ellipsoid or obovoid and quite regular in outline. In many species the next stage is characterized by a well-developed apiculus (which may be relatively enormous in *H. olivaceus*) and a tendency toward ovoid shape. As the spore matures the apiculus becomes shorter (and may disappear or break off as in *H. olivaceus*) and the spore becomes a darker brown, and may shrink somewhat in volume and, becoming more rounded, produce the characteristic markings of the epispore and utricle.

KEY TO SPECIES OF HYMENOGASTER

1. Peridium drying more than 300 μ thick 2
1. Peridium drying between 200 and 300 μ thick 3
1. Peridium drying between 130 and 200 μ thick 5
1. Peridium drying between 70 and 130 μ thick 14
1. Peridium drying less than 75 μ thick 28
   2. Peridium 320–1000 μ thick, white, changing to pink to red or purple when touched; spores broadly ellipsoid, rounded above, truncate below, verrucose, 7–10 × 5–6 μ ..... *H. ruber* (p. 636)
   2. Peridium drying 400–640 μ thick, greenish-yellow above, pale yellow to almost white below, drying chamois to brownish; spores smooth to very finely verrucose, 4–5-angled in optical-section, 10–14 × 5–7.5 μ ..... *H. pachydermis* (p. 637)
3. Spores smooth with a thick epispore, broadly citriform with apiculus, 22–26 × 12–15 μ [cf. *H. uliginosus* (p. 639)] ..... *H. Bulliardi* (p. 638)
3. Spores at least slightly roughened, not apiculate 4
   4. Spores more than 18 μ long, oblong-ellipsoid or fusiform, slightly roughened, slightly pedicellate, 19–23 × 9.5–12 μ ..... *H. lycoperdineus* (p. 639)
   4. Spores more than 8 μ broad, broadly ellipsoid or ovoid, rounded at both ends, evenly and finely verrucose, with utricle before maturity, 11.4–17 (–18.5) × 8–11 μ ..... *H. albus* (p. 640)
   4. Spores less than 8 μ broad, obtusely obovoid to ellipsoid, finely warted or asperulate, 10–13 × 6–8 μ ..... *Arcangeliella nana*
5. Peridium duplex or at least of two more or less distinct layers 6
5. Peridium simplex, homogeneous or with no more differentiation than a darker rind of superficial hyphae distinct from the general context of the peridium 7

6. Surface viscid, outer gelified, clear layer 30–40 μ thick (dry), inner layer stupose, 90–130 μ thick; spores broadly oblong-ellipsoid, obtuse at both ends, 13–15.5 × 9–10.5 μ.....*H. viscidus* (p. 642)
6. Surface not viscid, outer layer cottony, inner layer prosenchymatous; spores mostly obovoid, with or without apiculus, verrucose to roughly beaded, 14.8–18.5 × 8–11 μ.....*H. tener* (p. 642)
6. Surface not viscid, outer layer fibrous, inner layer parenchymatous; spores ellipsoid, attenuate at ends, mucro free when young, becoming involved in exospore, 20–30 × 12–18 μ.....*H. Bucholtzi* (p. 644)
7. Surface and gleba changing to bluish when bruised, pyriform with a prominent sterile base; spores rounded above, rugose as mere striations, 12–23 × 9–11 μ.....*H. pyriformis* (p. 644)
7. Surface and gleba not changing to bluish where bruised..... 8
8. Spores less than 15 μ long..... 9
8. Spores more than 15 μ long..... 10
9. Peridium prosenchymatous; spores more than 8 μ broad, verrucose, covered by a closely applied utricle, 12–15 × 8–11 μ.....*H. cerebellum* (p. 645)
9. Peridium stupose; spores less than 8.5 μ broad, with flaking utricle, verrucose, 11–12 × 7–8 μ.....*H. fragilis* (p. 646)
10. Spores apiculate, utricle very prominently roughened or torn..... 11
10. Spores not apiculate, utricle not prominently roughened or torn, except in *H. Gardneri*..... 12
11. Spores more than 12 μ broad; fructifications lemon-yellow when fresh, becoming fragile, carbonaceous at maturity [cf. *H. pruinatus* (p. 648)].....
.....*H. citrinus* (p. 646)
11. Spores less than 12 μ broad; fructifications white to grayish when fresh, drying buff .....*H. Gilkeyae* (p. 649)
12. Spores with a thick prominent epispore and very much roughened and torn, dark utricle, 18.5–26 × 11.5–14 μ.....*H. Gardneri* (p. 649)
12. Spores without a prominent epispore, and utricle thin, slightly wrinkled. 13
13. White, drying light yellow, surface flocculent to innate-fibrillose; peridium loosely stupose; spores ellipsoid or ovoid, broadly rounded at both ends, evenly and finely beaded at maturity, utricle wrinkled in immature spores, 11.4–17 (–18.5) × 8–11 μ.....*H. albus* (p. 640)
13. White, drying dark brown, surface smooth, hard, then cracked; peridium of homogeneous prosenchyma; spores obovoid, ellipsoid, broadly rounded above, almost smooth, then quite coarsely verrucose, 18–23 × 10–15 μ [cf. *H. pilosiusculis* (p. 651)].....*H. muticus* (p. 650)
13. White, drying cinnamon-buff to snuff-brown, surface whitish-villous; peridium densely stupose; spores ellipsoid with undulating surface and wrinkled clear utricle, 20–25 × 11–13 μ, pedicel 3–4 μ in diameter....*H. griseus* (p. 651)
14. Fructifications white, becoming bluish or bluish-green when bruised; spores with utricle having about 8 longitudinal folds.....
.....*H. caerulescens* (p. 652)
14. Fructifications white, becoming yellowish when bruised.*H. cinereus* (p. 653)
14. Fructifications changing to brownish or reddish-brown when bruised... 15
14. Fructifications unchanged or merely changing to dirty brownish when bruised 16

15. Spores broadly lanceolate or fusiform, with a longitudinally wrinkled utricle, 26–40 × 7.4–10.5 μ.....*H. Boozeri* (p. 653)
15. Spores ovoid- to ellipsoid-citriform, with an apiculus, rough, coarsely verrucose, 15–18.5 × 9.5–11.5 μ.....*H. niveus* (p. 654)
15. Spores broadly fusiform or obovoid, finely verrucose or wrinkled, 15–22 × 7–10 μ.....*H. spictensis* (p. 655)
    16. Surface distinctly viscid when moist; peridium duplex; spores minutely roughened, oblong-ellipsoid, both ends obtuse, 13–15.5 × 9–10.5 μ.....*H. viscidus* (p. 642)
    16. Surface not viscid, peridium simple..... 17
17. Spores covered by an open reticulate network of very distinct ridges, apiculate, citriform, 14.5–16 (–18.5) × 9.6–11 (–11.5) μ.....*H. reticulatus* (p. 656)
17. Spores seldom covered by a distinct network, if so partly obscured by verrucae or other markings..... 18
    18. Spores subspherical, minutely alveolate over the entire surface, 11.5–15 × 10–11.5 μ, very dark..... *H. atratus* (p. 656)
    18. Spores of other shapes, and if alveolate not uniformly so over the entire surface..... 19
19. Spores less than 17 μ long..... 20
19. Spores more than 17 μ long..... 22
    20. Spores more than 8.5 μ broad, apiculate, broadly ellipsoid to citriform, roughly verrucose, 12–15 × 9–11 μ.....*H. mutabilis* (p. 657)
    20. Spores more than 8.5 μ broad, rounded above, sculptured by small short ridges, yellow, 12–13 (–14.5) × 9.5–11 (–14) μ....*H. McMurphyi* (p. 658)
    20. Spores less than 8.5 μ broad..... 21
21. Fructifications yellowish-white; spores ellipsoid, exospore wrinkled, 12–16 × 5–7 μ.....*H. disciformis* (p. 658)
21. Fructifications whitish, becoming dirty white or buff on drying; spores broadly fusiform or ellipsoid, verrucose, apiculate, 11–12 × 7–8 μ.....*H. fragilis* (p. 646)
21. Fructifications violet, turning brownish on drying; spores ellipsoid, finely areolate-verrucose, obtusely pointed, 8–10 (–11) × 4.4–5.6 (–7) μ.....*Arcangeliella Campbellae*
21. Fructifications white, becoming subfuscous; spores fusiform, exospore slightly roughened.....*H. minusculus* (p. 659)
    22. Spores with a very loosely applied utricle at maturity..... 23
    22. Spores with a closely applied, only somewhat wrinkled utricle at maturity..... 27
23. Fructifications lemon- or golden-yellow when fresh, drying brown; gleba drying almost black at maturity; spores large, 20–33 × 13–17 μ.....*H. citrinus* (p. 646)
23. Fructifications white or grayish when fresh..... 24
    24. Spores averaging less than 11 μ broad, at maturity very dark and oblong including loose utricle, young spores apiculate, obovoid or long-cylindrical, 17–23 × 10–12.5 μ.....*H. verrucosus* (p. 659)
    24. Spores averaging more than 11 μ broad..... 25
25. Gleba lilac-colored when fresh, becoming fuliginous; spores 18–24 × 12–14 μ (uncommon).....*H. lilacinus* (p. 660)

25. Gleba some shade of gray or brown when fresh; epispore thick, distinct... 26
26. Spores not apiculate, spherical when young, later ellipsoid, 20–30 × 15–20 μ.....*H. eurysporus* (p. 661)
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1. Hymenogaster ruber Harkness, Proc. Cal. Acad. Sci. Bot. III. 1: 246. 1899; Sacc. & Sydow in Sacc. Syll. Fung. 16: 254. 1902.

Hymenogaster versicolor Harkness, Proc. Cal. Acad. Sci. Bot. III. 1: 245. 1899; Sacc. & Sydow in Sacc. Syll. Fung. 16: 254. 1902.

Type: cotypes in Dudley Herb. at Stanford Univ.

Fructifications 1 × 2 × 4 cm., subspherical to oblong, white, becoming pale red and turning purple when touched, dark reddish in alcohol, surface flocculose; peridium varying greatly in thickness, about 320–1000 μ thick, the outer portion (about half) composed of coarse, stupose, thick-walled, intertwined

hyphae, and the inner portion of fine parallel hyphae, approaching prosenchyma in places; gleba isabella color, with flecks of the white septa, cavities small, filled with spores; septa 15–25 μ between hymenia, composed of slender, much-gelified, hyaline hyphae; basidia truncate-clavate, 20 × 6–7 μ, sterigmata 10–12 μ long, stout; spores olivaceous-brown, ellipsoidal to obovoid, 5–6 × 7–10 μ, verrucose with a broad attachment, exospore distinct.

Under *Quercus* and *Pseudotsuga*. Oregon, California and Chile. March to July.

The spores are olivaceous and have the general shape of the short ones in some species of *Hysterangium*. The broad scar of the sterigma, leaving the spore almost truncate below, and the general appearance of the gleba are also suggestive of *Hysterangium*. The species is included here because of the verrucose spores and the lack of a columella.

OREGON: Linn County, Roaring River Fish Hatchery, *S. M. Zeller 8208* (Zeller).
CALIFORNIA: Marin County, Mill Valley, *H. W. Harkness 248*, cotype of *H. ruber*, and *174*, cotype of *H. versicolor* (Stanford); Mt. Tamalpais, *H. E. Parks, 3100* (Univ. Cal.); Muir Woods, *C. W. Dodge 1577* (Dodge and Zeller).
CHILE: Magellanes, Punta Arenas, *R. Thaxter*, Hypog. 9 (Farlow).

2. HYMENOGASTER **pachydermis** Zeller & Dodge, sp. nov.

Fructificationes oblate spheroideae, 2–4 cm. diametro, 2.5–3 cm. altitudine, viridi-luteae, "chamois" vel buckthorn-brown" siccatae superne, subluteae vel albidae "cartridge-buff" vel "chamois" siccatae inferne, laeves vel innato-fibrillosae; basis sterilis inconspicua; peridium crassum, 2 mm. recens, 400–640 μ siccatum, dilute luteum, prosenchymaticum, superficie hyphis magnis laxis; gleba dilute brunnea, "walnut-brown" vel "Vandyke brown" siccata, locellis parvis; septa 10–20 μ crassitudine, hyphis periclinalibus gelificatis, scissilia magnis cum lacunis in angulis; basidia anguste clavata 10–14 × 4–5 μ, tetraspora; sporae ellipsoideae, ovoideae vel obovoideae, laeves vel minute verruculosae, 4–5 angulatae in sectione optica, 10–14 × 5–7.5 μ.

Type: in Cunningham, Dodge, and Zeller Herbaria.

Fructifications oblate spheroidal to chestnut-shaped, 2–4 cm. broad, 2.5–3 cm. high, firm, greenish-yellowish above to pale yellowish or almost white below when fresh, drying cartridge-buff to chamois below and chamois to buckthorn-brown above, surface smooth to soft dull innate-fibrillose; sterile base not conspicuous; peridium very thick, 2 mm. when fresh, drying

400–640 μ, dilute yellowish, homogeneous, prosenchymatous, with a surface of large loose hyphae; gleba light brown, drying walnut-brown to Vandyke brown, firm, cavities tiny at first, becoming larger with age (even splitting into very large hollows because of scissile septa); septa hyaline, of large gelified parallel hyphae, scissile with large openings at the angles, 10–20 μ thick; basidia narrowly clavate, 10–14 × 4–5 μ, 4-spored; spores ellipsoid, ovoid or obovoid, smooth to very finely verrucose, 4- to 5-angled in cross-section, 10–14 × 5–7.5 μ, light yellowish-brown *sub lente*.

Under leaves or on the ground under *Alnus*, *Eucalyptus*, and *Fagus*. Oregon, California, Australia, and New Zealand. November to April.

Oregon: Benton County, *S. M. Zeller 2260* (Zeller).

California: Alameda County, Shepard Cañon, near Oakland, *H. E. Parks 1167a*, and *C. W. Dodge 1586a* (Univ. Cal., Dodge, and Zeller).

Australia: Victoria, Follett County, *F. M. Reader* (Lloyd Mus., 06150).

New Zealand: North Island, Wellington, York Bay, *E. H. Atkinson* (com. G. H. Cunningham 1100); South Island, Nelson, Dun Mountain, *J. C. Neill*, type (com. G. H. Cunningham 1096, all Dodge and Zeller).

3. Hymenogaster Bulliardi Vittadini, Monogr. Tuberac. 23. 1831; Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843; Fung. Hypog. 71. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 876. 1883; DeToni in Sacc. Syll. Fung. **7**: 168–169. 1888.

Tuber moschatus Bulliard, Herb. France. II. Hist. Champ. **1**: 79. 1791; Bulliard & Ventenant, Hist. Champ. France, ed. 2. **1**: 79. 1809.

Illustrations: Bulliard, Herb. France. II. Hist. Champ. *pl. 479;* Tulasne, Ann. Sci. Nat. Bot. II. **19**: *pl. 17, f. 14–16;* Fung. Hypog. *pl. 10, f. 6;* Vittadini, Monogr. Tuberac. *pl. 3, f. 5.*

Type: specimens so determined in Broome Herb. (Brit. Mus.), E. Fries Herb. (Upsala), Bot. Mus. Berlin, and Tulasne Herb. at Paris.

Fructifications subspherical, 2.5–3.5 cm. in diameter, drying about 1.6 cm., sulcate, depressed below, surface smooth, dark, dirty brown, drying isabelline; peridium thick, drying 220–250 μ, loosely stupose, spongy, of large thin-walled prosenchyma,

with peculiar hyaline, burr-like inclusions, somewhat tenacious, not separable; gleba dense, dark ferruginous, drying Argus brown, cavities very small, nearly filled with spores at maturity; septa thin and fragile, drying 20–30 μ thick, dark brown, rather more hyaline toward the middle, but not truly scissile; basidia narrowly clavate, 4-spored; spores dark ferruginous, clear citrine under microscope, broadly citriform, rounded at the base, and broadly rounded above with small apiculus, epispore thick, smooth, 22–26 × 12–15 μ, pedicellate. Odor strong like that of bugs. (fide Vittadini).

In deciduous forests of hills and mountains. Italy and France. Spring to October.

ITALY: Lombardia, Milano, *C. Vittadini* (Brit. Mus., Lloyd Mus., Upsala, Berlin, and Paris).

FRANCE: Seine, Vincennes, *Tulasne*, Oct. 29, 1843 (Paris).

4. HYMENOGASTER ULIGINOSUS Soehner, Krypt. Forsch. **1**: 395. 1924.

Type: in Soehner Herb. but not seen.

Fructifications white, finally becoming fuscous, moderately regular, spherical, glabrous, up to 1 cm. in diameter, very firm; peridium 200–250 μ thick, pseudoparenchymatous, with hyphae collapsing without; gleba at first white, becoming dirty amethyst and violet, finally fuscous, cavities small; basidia 2-spored, clavate or cylindric, yellowish, 20–30 × 7–10 μ; spores almost opaque, with large oil drops, exospore thin, obovoid, with short retuse papillae, remains of broad and conspicuous sterigmata, 22–32 × 10–14 μ. Odor earthy or marshy.

In marshy soil in pine woods. Ismaning, Germany.

5. HYMENOGASTER LYCOPERDINEUS Vittadini, Monogr. Tuberac. 22. 1831; Tulasne, Fung. Hypog. 64. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 874. 1883; DeToni in Sacc. Syll. Fung. **7**: 171. 1888.

Splanchnomyces lycoperdineus Corda, Icones Fung. **6**: 42. 1854.

Illustrations: Corda, Icones Fung. **6**: *pl. 7, f. 81;* Tulasne, Fung. Hypog. *pl. 10, f. 5;* Vittadini, Monogr. Tuberac. *pl. 2, f. 5.*

Type: location unknown to us, although material from Vit-

tadini in Broome Herb., Berk. Herb., Fries Herb., Tulasne Herb., and slide from type in Lloyd Mus.

Fructifications spherical to irregular, the size of a walnut, surface silky, smooth, fuliginous-white, drying chamois; peridium 200–250 μ thick, composed of densely woven, stupose hyphae; gleba white, becoming pale ferruginous, cavities large, radiating from the base; septa hyaline, prosenchymatous, 35–42 μ thick; basidia slender-clavate, 2-spored; spores 19–23 × 9.5–12 μ, oblong-ellipsoid to fusiform, very dark, very slightly rough with a scarcely distinct appendiculus. Odor of onions or old cabbage stalks.

In clay. U. S. S. R. and Italy.

This species closely resembles *Tuber Borchii* in appearance and color.

U. S. S. R. [Russia]: Moskva, road to Pleskovo, near Mikhailovskoe, *F. Bucholtz*, July 29, 1906 (Farlow).

Italy: Lombardia, *C. Vittadini* (two slides in Lloyd Mus., one marked "type, Vitt.," the other "ex Vitt."); Milano, *C. Vittadini* (Kew and Upsala).

6. Hymenogaster albus (Klotzsch) Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **13**: 349. 1844; Fries, Summa Veg. Scand. 436. 1849.

Rhizopogon albus Berkeley in Smith, Brit. Fl. **5**[2]: 229. 1836, ? excl. syn.—*not* Fries, 1821.

Hymenangium album Klotzsch in Dietrich, Fl. Reg. Boruss. [Fl. Königr. Preuss.] **7**: no. 466. 1839; Corda, Anleit. z. Stud. Myc. lxxxiii. 1842.

Splanchnomyces albus Corda, Icones Fung. **6**: 40. 1854.

Hymenogaster Klotzschii Tulasne, Fung. Hypog. 64. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 875. 1883; DeToni in Sacc. Syll. Fung. **7**:170. 1888; Massee, Ann. Bot. **4**: 42. 1889 [often cited as Monogr. Brit. Gast. 42. 1889]; Hesse, Hypog. Deutschl. **1**:123–124. 1891; Th. M. Fries, Svensk Bot. Tidskr. **3**:275–276. 1909; Th. C. E. Fries, Ark. f. Bot. **17**[9]: 13. 1921.

Illustrations: Corda, Anleit. z. Stud. Myc. *pl. D, f. 47*[7-10]; Icones Fung. **6**: *pl. 8, f. 82;* Cordier, Champ. *pl. 59, f. 2;* Hesse, Hypog. Deutschl. **1**: *pl. 2, f. 10–13; pl. 7, f. 48;* H. Hoffmann,

Bot. Zeit. **14**: *pl. 5, f. 30;* Jahrb. f. wiss. Bot. **2**: *pl. 31, f. 31;* Klotzsch in Dietrich, Fl. Reg. Boruss. [Fl. Konigr. Preuss.] **7**: no. 466; Massee, Ann. Bot. **4**: *pl. 1, f. 24* [Monogr. Brit. Gast. *pl. 1, f. 24*]; Nees, Syst. d. Pilze, *pl. 27, f. 1–4;* Tulasne, Fung. Hypog. *pl. 10, f. 12.*

Type: The type of *Hymenangium album,* which is also theoretically the type of *Hymenogaster Klotzschii* Tulasne, was collected by Carl Bouché and Klotzsch in the botanical garden at Grünewald, near Berlin, but apparently no material has survived as it was not found in Berlin, Kew, nor Paris and was not seen by Tulasne. The type of *Rhizopogon albus* Berkeley (*non* Fries) and *Hymenogaster albus* Berkeley & Broome was based on material collected by J. D. Hooker, October, 1830, in the Botanic Garden at Glasgow, found in the Berkeley Herbarium at Kew, and better material in Berlin bearing the name "*Hymenangium album* Klotzsch" in Klotzsch's handwriting. One slice of this same material communicated by Berkeley is in Tulasne's herbarium at Paris and is the actual specimen upon which he based his description of *H. Klotzschii.* Therefore the Glasgow material should be considered the type of the species. In the description of *Rhizopogon albus* Berkeley (*non* Fries), Berkeley also cites a collection from Acton Burnell by Stackhouse which was not found at the British Museum nor at Kew.

Fructifications spherical, drying 0.5–2 cm. in diameter, white, drying maize-yellow with the darker portions buff-yellow; peridium flocculently stupose, 150–250 μ thick, the outer hyphae large, varicose, up to 13–14 μ in diameter, golden-yellow in mass, the inner more closely stupose and lighter yellow; gleba drying cinnamon-buff to tawny olive, cavities large, often 400 × 100 × 130 μ; septa 25–40 μ thick; spores ovoid to broadly ellipsoid or sometimes citriform, 11.4–17 (–18.5) × 8–11 μ, averaging 14 × 9.5–10 μ, rather finely and evenly beaded as seen in optical section, or rather coarsely verrucose toward the distal end, mostly without appendiculus.

On pots of cultivated plants, often *Eucalyptus,* in greenhouses, at various times of year. The native locality of this

species is unknown but we suspect that it will be found in the Australian or western American flora as it seems more nearly related to the species of these regions than to any European species.

EXSICCATI: Klotzsch, Herb. Viv. Myc. ed. 1, [Rabenhorst] 242, 1967.

SWEDEN: Upsala, Bot. Trädgård, *Gunnar Fries*, 1893, *Th. C. E. Fries*, 1905, *T. Lyenberg*, 25 XI, 1905 (all Upsala).

ITALY: *Mattirolo 10* (Lloyd Mus.).

GERMANY: Berlin, *P. Hennings*, Dec. 9, 1894 (Upsala), 1895, Apr., 1904 (Lloyd Mus. 04146); Giessen, *A. Braun*, 1853 (Berlin), *H. Hoffmann*, 1853, in Klotzsch, Herb. Viv. Myc. ed. 1, [Rabenhorst] 1967 (Farlow); Breslau, *L. Becker*, Feb., 1873, ex Herb. Thümen (N. Y. Bot. Gard. and Lloyd Mus. 0212).

GREAT BRITAIN: Scotland, Glasgow, *J. D. Hooker*, type (Kew, Berlin, and Paris).

MASSACHUSETTS: Cambridge, *E. Thaxter*, 1891, 1892 (Farlow).

CALIFORNIA: Alameda County, Berkeley, Botanic Garden, *G. Hahn* (com. N. L. Gardner 481, Univ. Cal. and Zeller).

7. HYMENOGASTER VISCIDUS Massee & Rodway, Kew Bull. Misc. Inf. **1898**: 127. 1898.

Illustrations: Rodway, Papers & Proc. Roy. Soc. Tasmania **1911**: *pl. 3, f. 8.*

Type: in Kew Herb.

Fructifications irregular, oblong, chestnut to chocolate, viscid, 3 × 1.5 cm.; peridium thick, tough, easily separable from the gleba, with outer gelified layer of periclinal hyphae 30–40 μ thick, inner layer 90–130 μ thick, of dark reddish-brown hyphae; gleba pale at first, dark brown in age, cavities radiating from the base, small, irregular; septa thick, brown, not scissile; basidia 3–4-spored; spores broadly oblong-ellipsoid, obtuse at both ends, 13–15.5 × 9–10.5 μ, minutely roughened, yellowish-brown to dirty brown in mass.

Oregon and Tasmania. (Under *Corylus*, Oregon. June.)

OREGON: Benton County, Noon, *J. L. Mielke* (Zeller 7631).

TASMANIA: Hobart, *L. Rodway 270*, type (Kew), *1115* (Lloyd), *1272a* (Dodge and Zeller).

8. HYMENOGASTER TENER Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **13**: 349. 1844; Ann. & Mag. Nat. Hist. I. **18**: 75. 1846; Tulasne, Fung. Hypog. 72. 1851; Berkeley, Outlines Brit. Fungol. 296. 1860; DeToni in Sacc. Syll. Fung. **7**: 174. 1888;

Massee, Ann. Bot. **4**: 46–47. 1889 [often cited as Monogr. Brit. Gast. 47–48. 1889]; Hesse, Hypog. Deutschl. **1**: 122. 1891.

Hymenogaster argenteus Tulasne, Giorn. Bot. Ital. **1**[2]: 55. 1844.

Hymenogaster lilacinus Berkeley, Brit. Fung. 305, *pro parte.—not H. lilacinus* Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843.

Splanchnomyces tener Corda, Icones Fung. **6**: 44. 1854.

Illustrations: Tulasne, Fung. Hypog. *pl. 1, f. 4; pl. 10, f. 1;* Massee, Ann. Bot. **4**: *pl. 1, f. 1; pl. 4, f. 54;* Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 47;* Corda, Icones Fung. **6**: *pl. 13, f. 108.*

Type: in Berkeley Herb. at Kew, distributed as *H. lilacinus* in Berkeley, British Fungi, 305. This material is mostly *H. citrinus,* but occasionally a fructification of *H. tener* may be found. The type of *H. argenteus* from France: Seine, Bois de Boulogne, *Tulasne,* is in Broome Herb. and Tulasne Herb.

Fructifications small, about 1 cm. in diameter, white, becoming dirty white, silky, smooth, sterile base hemispheric to conical in young plants, disappearing at maturity; peridium duplex, the outer layer stupose with soil inclusions, up to 480 μ thick, drying 100–200 μ, the inner layer of prosenchyma drying 37–50 μ; gleba white at first, becoming a delicate pink and finally umber-gray; septa hyaline, 30–40 μ thick, prosenchymatous, subhymenium pseudoparenchymatous; basidia 1–4-spored, broadly clavate, about 19 × 11 μ; spores ellipsoid to ovoid-citriform, apiculate when young, obovoid with rounded ends at maturity, surface verrucose to roughly verrucose, covered by a utricle, 14.8–18.5 × 8–11 μ.

Hypogeous in hard soil under *Quercus.* Europe and United States. September to December.

U. S. S. R. [Russia]: Moskva, Mikhailovskoe, *N. Mossolov,* July 25, 1906 (sub *H. arenarius*); road to Sekirino, *F. Bucholtz,* July 25, 1906; road to Pleskovo, *F. Bucholtz,* Aug. 7, 1906; Voronovo, *F. Bucholtz,* Aug. 20, 1907 (all Farlow).

Sweden: Uppland, Upsala Bot. Trädgård, *Th. M. Fries,* Feb., 1879 (sub *Hydnangium carneum,* Upsala).

Denmark: Nyköbing, Falster Vesterskov, *F. H. Möller* (Landbohojskolen, Köbenhavn).

Germany or Austria: (no locality, specimen marked "Tannenwald 6-7-1880," ex Boudier Herb. at Farlow).

GERMANY: Leipzig, *Th. M. Fries*, 1861 (Upsala).

FRANCE: Seine, Bois de Boulogne, *Tulasne*, Sept., 1844, type of *H. argenteus* (Paris and Brit. Mus.); Vaucluse, Avignon, Bouchet, *Tulasne*, Oct., 1844 (olim *H. argenteus*, Paris).

ENGLAND: Wiltshire, Rudloe, *C. E. Broome* (Kew).

MAINE: York County, Kittery Point, *E. Thaxter 1902x*, Sept. 18, 1902 (Farlow).

CALIFORNIA: Alameda County, Berkeley, *N. L. Gardner 223;* Monterey County, Pacific Grove, *N. L. Gardner & M. B. Nichols 298* (both Univ. Cal. and Zeller).

9. HYMENOGASTER BUCHOLTZI Soehner, Krypt. Forsch. 1: 395. 1924.

Type: in Soehner Herb. but not seen by us.

Fructifications white, often spotted with pale yellow, becoming subfuscous, very firm; peridium 150–200 μ thick, fibrous without, pseudoparenchymatous within; gleba at first white, becoming violaceous mixed with fuscous at maturity, cavities very small; spores hyaline, becoming golden and fuscous at maturity, 1–several-guttulate, ellipsoid, attenuate at each end; mucro free when young, becoming involved in the exospore which becomes almost round, 20–30 × 12–18 μ, without sculpture, 19–25 × 7–10 μ.

München, Gauting, Planegg, Erharting bei Mühldorf, Germany.

10. HYMENOGASTER **pyriformis** Zeller & Dodge, sp. nov.

Fructificationes gregariae vel caespitosae, 1–2 cm. diametro metientes, pyriformes vel subglobosae, albae hypogeae, luteae vel brunneae emersae, tactu caerulescentes, "drab" vel "olive-brown" siccatae, superficie laevi vel tomentulosa; basis sterilis prominens, inferne conica; caro fracta sectave caerulescens; peridium crassum in lateribus, tenuius superne, 200–400 μ crassitudine, prosenchymaticum, superficie hyphis paucis magnis laxis; gleba grisea, caerulescens secta, fusca siccata, locellis parvis, irregularibus, e basi sterili radiantibus; septa 18–30 μ crassitudine siccata prosenchymatica; basidia cylindrica, uni- vel bispora, sterigmatibus 4–8 × 1.8–2 μ; sporae magnitudine variabiles, 12–23 × 9–11 μ, ellipsoideae vel obovoideae, rotundatae, rugis parvis, irregulariter longitudinalibus anastomosantibus, obscure brunneae. Odor terreus.

Type: in Dodge and Zeller Herbaria.

Fructifications gregarious to cespitose, 1–2 cm. in diameter, pyriform to subglobose, emersed or wholly hypogeous, white while hypogeous, yellowish-brown where exposed, turning blue when touched or bruised, drying drab to olive-brown, surface

smooth to tomentulose; sterile base prominent, projecting, conical below; flesh turning blue where broken or cut; peridium thick on sides, thinner above, variable in thickness, 200–400 μ, drying 130–200 μ thick, consisting of prosenchyma, collapsing on drying, surface with a few loose large hyphae, white, turning bluish, drying hyaline; gleba grayish, turning bluish where cut, drying fuscous, cavities small, irregular, mostly radiating from the sterile base; septa drying 18–30 μ broad, of hyaline prosenchyma; basidia cylindrical, 1–2-spored, sterigmata 4–8 × 1.8–2 μ; spores extremely variable in size, 12–23 × 9–11 μ, ellipsoid to obovoid, with broadly rounded tips, slight, irregularly anastomosing longitudinal or diagonal wrinkles giving appearance of faint striations, medium dark brown. Mild earthy odor.

Gregarious or cespitose in grassy places under *Quercus agrifolia*. California. October.

California: Santa Clara County, Guadaloupe Mines, *H. E. Parks 262*, in part (Univ. Cal.), *Z262*, type (Dodge and Zeller).

11. Hymenogaster cerebellum Cavara, Fung. Longobard. Exsicc. Pugill. **3**: no. 109. 1893; Atti Ist. Bot. Pavia. II. **3**: 211–229, 324. 1894?; Rev. Myc. **16**:152–157. 1894; Sacc. Syll. Fung. **11**: 171–172. 1895.

Illustrations: Cavara, drawing accompanying type distribution, Fung. Longobard. no. 109; Atti Ist. Bot. Pavia. II. **3**: *pl. 25;* Rev. Myc. **16**: *pl. 148.*

Type: distributed in Cavara, Fung. Longobard. no. 109.

Fructifications 2–3 cm. in diameter, cerebriform, white, becoming yellowish (Cavara), drying cinnamon-buff, sterile base not seen; peridium 140 μ thick, of varicose hyphae compactly interwoven, simulating pseudoparenchyma, those on the outer surface thicker-walled, growing out and enfolding soil particles; gleba rose-lilac to yellow-ochraceous, drying Argus-brown, cavities large, irregular; septa 30–40 μ thick, of slender hyphae closely interwoven; basidia clavate, approaching cylindric; spores 12–15 × 8–11 μ, brown, ovoid, approaching citriform, more or less apiculate, verrucose, with a rather closely applied utricle.

Among roots of coniferous and deciduous trees in botanical gardens. Italy and France. Spring and summer.

Exsiccati: Cavara, Fung. Longobard. 109.

Italy: Lombardia, Pavia, *F. Cavara*, Fung. Longobard. 109, type distribution (Mo. Bot. Gard., N. Y. Bot. Gard., and Farlow).

France: Alpes Maritimes, Antibes, *Poirault* (Farlow).

12. Hymenogaster **fragilis** Zeller & Dodge, sp. nov.

Fructificationes siccatae 1–2 cm. diametro metientes, subsphericae vel pyriformes, albidae vel griseae, sordidae vel "cinnamon-buff" siccatae, basis sterilis prominens (ut in *Lycoperdon*) magnis cum cavitatibus, superficie laevi, floccosa vel sericea; peridium fragilis, hyalinum vel subluteum, stuposum, homogeneum, 130–160 μ crassitudine superne, 50–100 μ crassitudine inferne; gleba siccata "pecan-brown," cavitatibus magnis; septa fragilia, hyalina, 25–40 μ crassitudine, stuposa; basidia non visa; sporae brunneae, late fusiformes vel ellipsoideae, apiculo parvo, vel obtuse subcitriformes et pedicellatae, subasperatae vel subverrucosae, 11–12 × 7–8 μ.

Type: at Farlow Herb.

Fructifications drying 1–2 cm. in diameter, subspherical or pyriform, whitish or gray, drying dirty white or cinnamon-buff; sterile base well developed, with large cavities, resembling the stipe of *Lycoperdon;* surface even, floccose or silky; peridium fragile, hyaline or slightly yellowish, stupose, homogeneous, 130–160 μ thick above, sometimes 50–100 μ thick below; gleba drying pecan-brown, with large empty cavities; septa fragile, hyaline, 25–40 μ thick, stupose; basidia not seen; spores brown, ovoid, broad-fusiform to ellipsoid or obtusely subcitriform with a small apiculus and pedicel often inequilateral, verrucose with a flaking utricle, 11–12 × 7–8 μ.

California and southern Chile. February and March.

The spores resemble those of *Arcangeliella Campbellae* but are much larger.

California: *H. E. Parks 2182* (Univ. Cal).

Chile: Magellanes, Punta Arenas, *R. Thaxter F. H. 1, 4*, type, Feb. and March, 1906 (Farlow).

13. Hymenogaster citrinus Vittadini, Monogr. Tuberac. 21. 1831; Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843; Fung. Hypog. 69. 1851; Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **13**: 346. 1844; Fries, Summa Veg. Scand. 436. 1849; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 875. 1883; De

Toni in Sacc. Syll. Fung. **7**: 169. 1888; Massee, Ann. Bot. **4**: 45. 1889 [often cited as Monogr. Brit. Gast. 45. 1889]; Hesse, Hypog. Deutschl. **1**: 112–113. 1891; Th. M. Fries, Svensk Bot. Tidskr. **3**: 276. 1909; Hollós, Magyar. Földalatti Gombai, 91, 204. 1911; Th. C. E. Fries, Ark. f. Bot. **17**^{9}: 13. 1921; Soehner, Zeitschr. f. Pilzk. **2**: 157. 1923.

Splanchnomyces citrinus Corda, Icones Fung. **6**:43–44. 1854.

Hymenogaster Citrus Tulasne, Fung. Hypog. ed. 2. 74. 1853.

Splanchnomyces Citrus Corda, Icones Fung. **6**: 43. 1854.

Hymenogaster Pisomyces Fries, herb. nom.

Melanogaster Ferrarianus de Notaris, herb. nom.

Illustrations: Berkeley, Outlines Brit. Fungol. *pl. 20, f. 2;* Corda, Icones Fung. **6**: *pl. 9, f. 86, 87;* Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 29;* Massee, Ann. Bot. **4**: *pl. 1, f. 8;* Tulasne, Ann. Sci. Nat. Bot. II. **19**: *pl. 17, f. 9–10;* Fung. Hypog. *pl. 1, f. 1; pl. 10, f. 3;* Vittadini, Monogr. Tuberac. *pl. 3, f. 2; pl. 5, f. 9b.*

Type: in Broome Herb., Fries Herb., and Tulasne Herb. Type of *H. Citrus* probably England, Wiltshire, Rudloe, *C. E. Broome,* com. Berkeley but not seen by us. Type of *H. Pisomyces* collected by *E. P. Fries* in the Bot. Trädgård at Upsala, specimens in Kew and in Upsala.

Fructifications 2–4 cm. in diameter, irregularly subglobose, lemon- or golden-yellow, drying clay-color to tawny-olive, or black at maturity; surface even, silky to dull fibrillose; peridium stupose near surface, prosenchymatous, of large cells below, 80–150 μ thick, dark brown, brittle when dry; gleba yellow, then brownish when fresh, drying Prout's brown to sooty black and brittle like charcoal, cavities relatively large; septa rather broad, 60–80 μ, of compact prosenchyma; basidia 2-spored, 22–32 × 12–15 μ; spores 20–35 × 13–17 μ, broadly fusiform to obovoid, diamond-kite-shaped at maturity, apiculate, with narrow base, smooth when young, becoming coarsely verrucose at maturity, covered by a variously wrinkled utricle which is thin, brownish, but dark umbrinous at maturity.

Hypogeous, under deciduous and coniferous trees. Europe and New York. April to December.

U. S. S. R. [RUSSIA]: Kedfil Wald, *F. Bucholtz*, Aug. 3, 1909; Moskva, Mikhailovskoe, *F. Bucholtz 6b, 7a*, Aug. 25, 1910; *E. Sheremetev* (all Farlow).

SWEDEN: Uppland, Upsala, Karolinaparken, *Th. M. Fries*, 1879, Aug. 11, 1883, Sept., 1883, Sept., 1885, Oct., 1885; Botaniska Trädgård, *Th. M. Fries*, 1851, *E. P. Fries*, 1851 (sub *Octaviania Pisomyces* n. sp.,? all Upsala).

GERMANY: ex herb. Kupka, without locality (Berlin); Bayern, München, *E. Soehner 945, 995, 1025*, 1924 (Soehner); Hessen-Nassau, Kirchditmold, *E. Hesse*, Apr., 1890 (Hesse).

AUSTRIA: Wien, *Soehner 1601* (Soehner).

ITALY: Trentino, *G. Bresadola*, July, 1879 (Upsala); Lombardia, Milano, *C. Vittadini* (Brit. Mus., Upsala, and Paris); without locality, *Ferrari* (sub *Melanogaster Ferrarianus*, com. De Notaris, Curtis Herb. at Farlow).

FRANCE: Seine, Vincennes, *Tulasne* (Paris); without locality, eastern France, *L. Quélet* (Upsala).

ENGLAND: Wiltshire, Westbury, *G. H. K. Thwaites* (sub. *H. olivaceus*); Rudloe, *C. E. Broome*, 11/10, 1842; Sussex, Reigate, *C. E. Broome*, Nov., 1879 (all Kew).

NEW YORK: Ithaca, lower Forest Home path, *H. S. Jackson* (N. Y. State Coll. Agr., Cornell Univ. 9920, det *H. tener* by H. M. Fitzpatrick and H. H. Whetzel).

13a. var PALLENS Soehner, Krypt. Forsch. **1**: 397. 1924.

Type: in Soehner Herb. but not seen by us.

Differs from the typical form in fructifications being light yellow and spores sometimes almost spherical, with a long pedicel up to 12 μ, along with typical *H. citrinus* spores; spores including pedicel 25–55 × 7–14 μ.

Vicinity of München. Rare.

14. HYMENOGASTER PRUINATUS Hesse, Hypog. Deutschl. **1**: 113. 1891; Sacc. Syll. Fung. **11**: 170. 1895.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 31.*

Type: location unknown to us.

Fructifications the size of a hazel-nut and larger, very irregular, light yellow at first, finally becoming dark yellow and brownish; peridium 0.5 mm. thick, composed of loosely woven pseudoparenchyma of large thin-walled cells surrounded by a few hyphae, somewhat as in *H. decorus* Tul.; gleba firm, dark brown, cavities small; septa brown, fairly thick, composed of closely woven, richly septate hyphae; basidia slender, mostly 2-spored, projecting beyond the paraphyses; spores citriform, appendiculate, with short (2 μ), sharp papilla, 21–27 × 10–14 μ, exospore thin, bright, becoming dark brown, sometimes surrounded by a sheath.

In old beech woods. Hessen-Nassau, Germany. August and September.

15. HYMENOGASTER **Gilkeyae** Zeller & Dodge, sp. nov.

Fructificationes depresso-globosae vel irregulares, 1–2.5 cm. diametro metientes, albae vel albidae, "cartridge-buff" vel "cream-buff" siccatae, laeves, sericeae; basis sterilis pulvinata vel conica; peridium hyalinum, prosenchymaticum, 130–200 μ crassitudine, superficie stuposa; gleba nigro-umbrina recens, "snuff-brown" siccata; septa 37–56 μ crassitudine, hyalina, prosenchymatica, cellulis vesiculosis, angulis scissilia; basidia 2- vel 4-spora, sterigmatibus brevibus, crassis; sporae ovoideo-citriformes, apiculo pedicelloque prominentibus, utriculo dilacerato evanescente, episporio verrucoso, 15–22 × 10–11 μ. Odor Hamamelidis.

Type: in Univ. Cal., Dodge, and Zeller Herbaria.

Fructifications depressed-globose to irregular, 1–2.5 cm. in diameter, snow-white to grayish, drying cartridge-buff to cream-buff, smooth to silky; sterile base pulvinate to conical; peridium hyaline, homogeneous, prosenchymatous, 130–200 μ thick with a very thin stupose surface; gleba dark umber when fresh, drying snuff-brown; septa 37–56 μ thick, of hyaline prosenchyma of vesicular cells, scissile at angles; basidia 2- and 4-spored, sterigmata short, stout; spores ovoid-citriform, with prominent apiculus and pedicel, at first with utricle which sloughs ragged, leaving verrucose surface, 15–22 ×10–11 μ. Odor of musty flowers and witch-hazel.

In mixed woods and under *Aesculus* and *Quercus*. Oregon and California. November to April.

OREGON: Benton County, Corvallis, *J. L. Mielke* (Zeller 6897); Linn County, Peoria Road, *H. M. Gilkey* (Oregon State, and Zeller 2335); near Roaring River Fish Hatchery, *S. M. Zeller 8201, 8203* (Zeller).

CALIFORNIA: Alameda County, Berkeley, *N. L. Gardner 57;* Santa Clara County, *H. E. Parks 983*, type; Alma, *H. E. Parks 162B* (com. N. L. Gardner 546); Guadaloupe, *H. E. Parks 433A*, Apr. 22, 1921; Santa Cruz County, Felton, *H. E. Parks 501;* Monterey County, Pacific Grove, *N. L. Gardner & M. B. Nichols 303* (all Univ. Cal., Dodge, and Zeller); San Mateo County, Jasper Ridge in Palo Alto, *James McMurphy 274, 282, 298* (Stanford and Zeller).

16. HYMENOGASTER **Gardneri** Zeller & Dodge, sp. nov.

Fructificationes 1–1.5 cm. diametro metientes, irregulares, rimosae, firmissimae, sordide albidae brunnescentes, "buff-brown" siccatae, laeves vel floccosae; peridium 80–150 μ crassitudine siccatum, hyalinum, prosenchymaticum, hyphis floccosis in superficie; gleba brunnea, solida, aquosa, locellis parvis; septa hyalina, prosen-

chymatica, 10–20 μ crassitudine siccata; basidia anguste clavata, 2–4-spora; sporae nigro-brunneae, late ellipsoideae, subfusiformes, episporio laevi, crasso, utriculoque obscuro, aspero, lacerato, rugis longitudinalibus in sporis immaturis, pedicellato, 18.5–26 × 11.5–14 μ.

Type: in Univ. Cal., Dodge, and Zeller Herbaria.

Fructifications 1–1.5 cm. in diameter, irregular in shape, checking and cracking, very firm and compact, at first dirty white, becoming brown, drying buff-brown, surface smooth to flocculent; peridium of tough, hyaline, homogeneous prosenchyma, with flocci of hyphae on the surface, drying 80–150 μ thick; gleba brown, firm, watery, cavities relatively small; septa of hyaline prosenchyma, drying 10–20 μ thick; basidia narrowly clavate, 2- and 4-spored; spores very dark brown, broad-ellipsoid, tapering to both ends, epispore smooth, thick, but with a very dark, rough, torn utricle with more or less longitudinal folds as shown by immature spores, pedicellate, 18.5–26 ×11.5–14 μ.

In clay soil under *Quercus* and *Salix*. California. March.

The type of this species, although near to *H. citrinus* and *H. olivaceus (H. decorus)*, is very distinct in the young spores, which approach the characters of *H. lycoperdineus*. Gardner's No. 279 is referred here with some doubt, since the mature spores are quite similar to those in the type of *H. Thwaitesii*.

California: Alameda County, Berkeley, *N. L. Gardner 89* type, *279* (Univ. Cal., Dodge, and Zeller); San Mateo County, Palo Alto, *James McMurphy 290* (Stanford and Zeller).

17. Hymenogaster muticus Berkeley & Broome, Ann. & Mag. Nat. Hist. II. **2**: 267. 1848; Tulasne, Fung. Hypog. 65. 1851; Cooke, Handbook Brit. Fung. **1**: 360. 1871; DeToni in Sacc. Syll. Fung. **7**: 172. 1888; Massee, Ann. Bot. **4**:42–43. 1889 [often cited as Monogr. Brit. Gast. 42–43. 1889]; Hesse, Hypog. Deutschl. **1**: 118–119. 1891.

Illustrations: Massee, Ann. Bot. **4**: *pl. 1, f. 20;* Tulasne, Fung. Hypog. *pl. 10, f. 7.*

Type: in Berkeley Herb. 4459, in Hooker, and in Cooke at Kew, Fries Herb. at Upsala, and fragment in Lloyd Mus.

Fructifications usually spherical, occasionally irregular, smooth becoming rimose, about 1 cm. in diameter, white, becoming dark brown; peridium 150–200 μ thick, composed of homogeneous prosenchyma, distinct from the gleba, easily separable; gleba reddish-brown to dark brown, cavities small near the peridium, larger within; septa thin, 20–40 μ thick, fibrous; basidia rather large, 2-spored; spores 18–23 × 10–15 μ, appendiculus 2 × 2 μ, usually not papillate but broadly obtuse, obovoid, deep red-brown, with a wavy-wrinkled surface.

Hypogeous. Western Europe. Early spring.

SWEDEN: Upsala, *K. A. Th. Seth*, 1891 (Upsala).
FRANCE: Alpes Maritimes, Nice, *Barla* (Farlow); *L. Quélet*, 1889 (Upsala).
ITALY: Trentino, *G. Bresadola*, May, 1888 (Upsala).
ENGLAND: Gloucestershire, Stapleton Grove, *C. E. Broome*, type (Kew, Upsala, Lloyd 0213).

18. HYMENOGASTER PILOSIUSCULUS Hesse, Hypog. Deutschl. 1: 127. 1891; Sacc. Syll. Fung. 11: 171. 1895.

Illustrations: Hesse, Hypog. Deutschl. 1: *pl. 7, f. 38.*

Type: location unknown to us.

Fructifications somewhat larger than a hazel-nut, irregular, often flattened, citron to dark yellow; peridium a strong line thick, composed of small-celled pseudoparenchyma loosely arranged, with slender hyphae next the gleba; gleba citron-yellow, cavities small and filled with spores; septa composed of slender hyphae; basidia 2-spored, fairly long and broad, paraphyses similar but septate; spores 16–26 × 4–8 μ, rounded at the apex, without a papilla, with a short slender appendiculus, yellowish, exospore wrinkled.

Under stands of *Fagus*. Hessen-Nassau, Germany. August to October.

19. HYMENOGASTER GRISEUS Vittadini, Monogr. Tuberac. 23. 1831; Tulasne, Fung. Hypog. 69. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. 1: 875. 1883; De Toni in Sacc. Syll. Fung. 7: 170. 1888; Massee, Ann. Bot. 4: 48. 1889 [often cited as Monogr. Brit. Gast. 48. 1889]; Hesse, Hypog. Deutschl. 1: 131–132. 1891.

Illustrations: Hesse, Hypog. Deutschl. 1: *pl. 7, f. 36;* Payer, Bot. Cryptog. 114. *f. 258;* Roumeguère, Cryptog. Ill. *f. 372.*

Type: location unknown to us; however, material from Vittadini so determined in Herb. E. Fries at Upsala.

Fructifications small, 1–1.5 cm. in diameter, subglobose, not shrinking much on drying, surface white at first, drying cinnamon-buff to snuff-brown, whitish-villous to innate-fibrillose; sterile base scarcely visible; peridium 185 μ thick, densely stupose; gleba gray, soon becoming dark, drying bister; septa of thin-walled hyphae, 30–40 μ thick; basidia long, cylindric, 2-spored, sterigmata stout, 11–13 μ long; paraphyses slender, septate; spores ellipsoid, distal end obtuse and rounded, undulating surface with a clear wrinkled utricle, brown becoming black, 20–25 × 11–13 μ, pedicel 2–3 μ long, 3–4 μ in diameter. Odor of *Convallaria majalis.*

Under *Populus, Quercus,* and *Fagus.* Italy, Oregon, and Argentina.

Italy: Trentino, *G. Bresadola,* Aug., 1886, (Upsala); Lombardia, Milano, *C. Vittadini* (Upsala).

Oregon: Benton County, Alsea Road along Greasy Creek, *H. M. Gilkey* (Oregon State, and Zeller 2802).

Argentina: Buenos Aires, *E. Thaxter,* 1905, (Farlow).

20. Hymenogaster caerulescens Soehner, Zeitschr. f. Pilzk. 1: 6–8. 1922; E. Fischer, Veröffentl. Geobot. Inst. Rübel in Zürich 3: 578–581. 1925.

Hymenogaster caespitosus Soehner, Krypt. Forsch. 1: 396–397. 1924.

Type: in Soehner Herb.

Fructifications spherical to subspherical, small, 1–2 cm. broad, white, becoming bluish-green when bruised or touched, drying grape-green to Andover green, surface even to ruptured, fibrillose to byssoid; peridium hyaline, thin, 90–130 μ thick, of large-celled pseudoparenchyma, with a very few superficial large-celled, multi-septate hyphae; gleba white or brown when fresh, turning bluish-green when cut, drying light chalcedony with flecks of darker green or fuscous-black; septa hyaline, pseudoparenchymatous, 60–75 μ thick; basidia nar-

rowly clavate, mostly 4-spored; spores very dark brown, 19–22 × 12–15 μ, ellipsoid with very obtuse ends, utricle with 8 longitudinal folds, apiculus slight but often apparent, pedicel often adhering, hyaline.

On wet ground or under moss in coniferous or deciduous woods. Germany and northern California. July to November.

The spores of this species are similar to those of *Gautieria*, but *H. caerulescens* lacks a columella.

GERMANY: Bayern, Mühldorf, *E. Soehner 497*, type, *613* (Soehner).
CALIFORNIA: Humboldt Co., Trinidad, *H. E. Parks 4622* (Univ. Cal. and Zeller).

21. HYMENOGASTER CINEREUS Hesse, Hypog. Deutschl. **1**: 132. 1891; Sacc. Syll. Fung. **11**: 171. 1895.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 37*.

Type: location unknown to us.

Fructifications the size of a horse-bean, somewhat ragged, irregular, snow-white becoming yellowish when touched; peridium scarcely a line thick, composed of long, slender, septate hyphae; gleba ashy; basidia narrow-cylindrical, 2-spored, projecting beyond the septate paraphyses; spores fusiform, reddish-yellow, 21–30 × 9–12 μ, with a short, hyaline papilla and an appendiculus 1 × 1 μ.

Under old trees of *Fagus* and *Quercus*. Hessen-Nassau, Germany. August to November.

22. HYMENOGASTER **Boozeri** Zeller & Dodge, sp. nov.

Fructificationes 1–1.5 cm. diametro metientes, depresso-globosae, albidae tactu brunnescentes, "bister" siccatae, laeves; peridium homogeneum, hyalinum, prosenchymaticum extero obscurius densiusque, 120–160 μ crassitudine (100–130 μ siccatum); gleba subalbida vel griseo-brunnea, "cinnamon-buff" siccata, locellis magnis; septa 20–35 μ crassitudine, prosenchymatica; basidia clavata, 18–25 × 6–8 μ, bispora, sterigmatibus brevissimis, 2–3 μ longitudine, crassis; sporae maturae, 24–30 × 13–15 μ, obscure brunneae, ovoideo-ellipsoideae vel late fusiformes, episporio crasso, utriculo longitudinaliter rugoso, rimoso, sporae juniores elongatae, cylindricae, lanceolatae vel anguste fusiformes, 26–40 × 7.4–10.5 μ, laeves. Odor caseosus.

Type: in Oregon State, Dodge, and Zeller Herbaria.

Fructifications 1–1.5 cm. in diameter, depressed-globose, whitish, staining brownish where touched, drying bister, sur-

face smooth; peridium composed of homogeneous, hyaline prosenchyma with a darker rind of a more compact prosenchyma, 120–160 μ thick when fresh, drying 100–130 μ; gleba with large cavities, almost white to grayish-brown, drying cinnamon-buff; septa 20–35 μ thick, prosenchymatous; basidia clavate, 18–25 × 6–8 μ, 2-spored, sterile basidia common as figured by Tulasne for *H. citrinus*, sterigmata very short (about 2–3 μ long), stout; mature spores 24–30 × 13–15 μ, dark brown, ovoid-ellipsoid to broadly fusiform, thick epispore with a longitudinally wrinkled utricle which flakes off, immature spores long-cylindrical to lanceolate or narrowly fusiform, 26–40 × 7.4–10.5 μ, smooth. Odor like cheese (fermentation).

Under *Quercus*. Oregon. April.

This species resembles *H. vulgaris* in color of the fructification and utricle of the spores, but differs in several other respects.

Oregon: Benton County, Corvallis, *L. M. Boozer*, type (Oregon State, Dodge, and Zeller 2286).

23. Hymenogaster niveus Vittadini, Monogr. Tuberac. 24. 1831; Tulasne, Fung. Hypog. 65. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 876. 1883; DeToni in Sacc. Syll. Fung. **7**: 172. 1888; Soehner, Hedwigia **64**: 192–202. 1923.

Illustrations: Fourquignon, Champ. Supér. 123. *f. 93;* Soehner, Hedwigia **64**: 196; Vittadini, Monogr. Tuberac. *pl. 4, f. 9.*

Type: material from Vittadini in Berk. Herb. at Kew, and in Lloyd Mus.

Fructifications about 1 cm. in diameter, subspherical, drying somewhat irregular, snow-white, reddening to the touch when fresh, drying ochraceous-tawny to buckthorn-brown or even darker, sterile base evident; peridium 300–320 μ thick, drying 60–110 μ, composed of compactly woven hyphae (prosenchyma in islands) with larger varicose hyphae 5–6 μ in diameter; gleba light fuliginous, becoming very dark brown, cavities large; septa thin, 15–20 μ thick, composed of slender, compact, gelified hyphae; basidia 2-spored, pyriform, 8–9 × 5–6 μ, projecting above the septa, not numerous and early collapsing, so that the sterigmata appear to arise directly from the septal

hyphae; spores rather large, warted, short-pedicellate, ovoid- to ellipsoid-citriform, with short, blunt, hyaline apiculus, 15–18.5 × 9.5–11.5 μ. Odor of *Pelargonium*.

Hypogeous under deciduous and coniferous trees. Europe and North America. May to September.

ITALY: Lombardia, Milano, *C. Vittadini;* Trentino, *G. Bresadola* (both Kew).
GERMANY: Bayern, München Süd, *E. Soehner 843* (Soehner).
ENGLAND: *C. E. Broome* (Lloyd Mus. 0222).
CANADA: Quebec, Little Métis, *E. C. Jeffrey* (Farlow).
MICHIGAN: Ann Arbor, *C. H. Kauffman 21* (Univ. Mich. and Zeller).
OREGON: Benton County, Corvallis, *S. M. Zeller 8197* (Zeller).

24. HYMENOGASTER SPICTENSIS Patouillard, Bull. Soc. Myc. France **30**: 350–351. 1914; Trotter in Sacc. Syll. Fung. **23**: 599. 1925.

Type: no specimen cited as type by Patouillard, but all material so determined by him in his herbarium at the Farlow Herb. is this species.

Fructifications from about the size of a pea to that of a filbert, spherical, rarely irregular, always a little depressed at the base, pure white, becoming grayish or rufous when touched, brown in alcohol; peridium thin, drying 90–100 μ thick, composed of elongated cells, more slender toward the periphery, from which is derived the granular hyphae (2–5 μ thick); gleba white, cream, rufous, and finally deep chestnut, sterile base absent; basidia cylindric, 25–35 × 4–10 μ, with four short sterigmata; spores ferruginous-yellow, broadly fusiform to obovoid, narrow, obtuse at the apex and often appendiculate below, epispore verruculose and wrinkled, 15–22 × 7–10 μ, occasionally as short as 12 μ or as long as 25 μ, 2–3-guttulate.

Under *Quercus, Fagus, Betula.* Central Europe. June to December.

U. S. S. R. [RUSSIA]: Moskva, Mikhailovskoe, *F. Bucholtz,* Aug. 26, 1907; Sekirino, *F. Bucholtz & N. Mossolov,* Aug. 23, 1907; Senjkino, *F. Bucholtz,* July 26, 1906; Shebaly forest near Mikhailovskoe, *N. Mossolov,* July 24, 1906; *F. Bucholtz,* July 26, 1906; Voronovo, *F. Bucholtz,* Aug. 22, 1907 (all Farlow).
GERMANY: Bayern, München, *E. Soehner 942* (sub *H. Rehsteineri??*, Soehner).
ITALY: Trentino, *G. Bresadola,* July, 1880, Dec., 1888 (sub *H. niveus* Vitt., Upsala).
AUSTRIA: Vorarlberg, Feldkirch, *F. Theissen* (Farlow).

FRANCE: *L. Quélet* (Upsala); Barezian, *N. Patouillard*, Oct., 1913, (Farlow); Lepinay, *N. Patouillard*, Aug., 1912, Aug., 1913 (Farlow); Doubs, Hérimoncourt, *L. Quélet* (sub *H. niveus*, Upsala); Belfort, Delle, *L. Quélet* (sub *H. lycoperdineus*, Upsala); Jura, Joye de Buron, *N. Patouillard*, Oct., 1906 (Farlow).

25. HYMENOGASTER **reticulatus** Zeller & Dodge, sp. nov.

Fructificationes subsphericae, ad 1 cm. diametro metientes, umbonatae, pallidae vel flavo-brunneae, superficie laevi spongiosa; peridium 70–120 μ crassitudine siccatum, hyphis tenuissimis, laxe implicatis, stuposis; gleba sordide brunneo-albida, "cinnamon-buff" vel "tawny-olive" siccata, fragilis, locellis parvis, irregularibus; septa scissilia, 25–30 μ crassitudine, hyphis laxe implicatis; basidia anguste clavata, bispora, sterigmatibus tenuibus, brevibus; sporae obscure brunneae, late citriformes, apiculo prominente, laevi, episporio reticulate foveolato, 14.5–16 (–18.5) × 9.6–11 (–11.5) μ.

Type: in Cleland, Dodge, and Zeller Herbaria.

Fructifications subspherical, about 1 cm. in diameter, with a small umbo, pallid with yellowish-brown tints, drying cinnamon-buff to tawny-olive, surface smooth but spongy; peridium about 70–120 μ thick (dry), of very slender loosely woven stupose hyphae, hyaline to citrine; gleba dirty brownish-white, drying cinnamon to tawny-olive, fragile, cavities irregular, relatively small; septa hyaline, scissile, 25–30 μ thick, of rather loosely interwoven hyphae; basidia 2-spored, slender, clavate, sterigmata slender, short; spores dark brown, broadly citriform with a prominent smooth apiculus, 14.5–16 (–18.5) × 9.6–11 (–11.5) μ, exospore reticulate-pitted, pits averaging 2 μ broad.

Hypogeous. South Australia. April.

The spores of this species are evenly and beautifully reticulate-pitted, the markings strikingly distinct from those of other species.

In the type collection the surface of the peridium is overgrown by a mycelium of yellowish, clear hyphae about 4 μ in diameter, having clamp connections and clavate tips about 7–8 μ broad. It could not be determined whether this mycelium is organically connected with *H. reticulatus*.

AUSTRALIA: South Australia National Park, *J. B. Cleland 6*, Apr. 29, 1924, type (Dodge and Zeller).

26. HYMENOGASTER **atratus** (Rodway) Zeller & Dodge, comb. nov.

Hysterangium atratum Rodway, Papers & Proc. Roy. Soc. Tasmania **1919**: 112. 1920.

Type: A specimen without locality data but marked "cotype 1265" has been kindly communicated to us by Rodway.

Fructifications subspherical, 1.5–2 cm. in diameter, viscid, dark brown; peridium thin but tough, fleshy, 60–120 μ thick, pseudoparenchymatous; gleba dark brown, cavities small; septa of hyaline prosenchyma, 15–20 μ thick; spores dark brown, nearly spherical to broadly ellipsoidal, 11.5–15 × 10–11.5 μ, minutely alveolate, short-pedicellate, the utricle or alveolae almost hyaline.

Hypogeous. Australia and Tasmania. July.

AUSTRALIA: S. Australia National Park, *J. B. Cleland 16* (Dodge and Zeller); Queensland, Rockhampton, *A. Thozet* (sub. *H. Klotzschii*, Kew).
TASMANIA: [Mt. Nelson Range], *L. Rodway 1123, 1265* (Dodge and Zeller).

27. HYMENOGASTER **mutabilis** (Soehner) Zeller & Dodge, comb. nov.

Hymenogaster tener var. *mutabilis* Soehner, Hedwigia **64**: 200. 1923.

Illustrations: Soehner, Hedwigia **64**: 196.

Type: in Soehner Herb.

Fructifications 1–3 cm. in diameter, subglobose, whitish to yellowish when fresh, drying fuscous, surface smooth to soft-silky; peridium 75–100 μ thick, loose-stupose with inclusions of many hyaline, diamond-shaped crystals; sterile base distinct in young specimens, pulvinate; gleba yellowish, with reddish, violet, red-brown to ochraceous tones, drying Verona brown, cavities small; septa prosenchymatous, 15–25 μ thick; basidia 2-spored; spores dark brown, broadly ellipsoid to citriform, short-pedicellate, mostly with very small apiculus, wrinkled to verrucose surface with a closely applied utricle, 12–15 × 9–11 μ.

Hypogeous in rich soil in deciduous woods. Germany and North America. July to September.

GERMANY: Bayern, München, Englische Gärten, *E. Soehner 703*, type (Soehner).
CANADA: Manitoba, *G. R. Bisby* (Zeller 7462).
NEW YORK: Onandaga County, Syracuse, *A. H. Povah 832* (Farlow).

28. HYMENOGASTER **McMurphyi** Zeller & Dodge, sp. nov.

Fructificationes oblate sphaeroideae vel irregulares, 1–1.5 cm. diametro metientes, luteae, obscuriores siccatae, superficie fibrosa, subaspera; basis sterilis parva, pulvinata; peridium 120–180 μ (55–100 μ siccatum) crassitudine, luteum, extus stuposum, intus laxe prosenchymaticum; gleba lutea vel "snuff-brown" ("bone-brown" siccata post conservationem); septa 24–32 μ inter hymenia, hyphis luteis laxe contexta, scissilia in angulis; basidia late clavata, tri- vel tetraspora, sterigmatibus tenuissimis, 5–7 μ longitudine, hyalina; sporae luteae, late ovoideae, insuper rotundatae, saepe pedicellatae, episporio crasso, tenuibus cum rugis brevibus, uniguttulatae, 12–13(–14.5) × 9.5–11(–14) μ.

Type: in Dudley Herb. at Stanford, Zeller and Dodge Herbaria.

Fructifications oblate-spheroidal to irregular, about 1–1.5 cm. in diameter, yellow, drying darker, surface fibrous-roughened; sterile base slight, pulvinate; peridium 120–180 μ (drying 55–100 μ) thick, yellow, stupose without, loosely prosenchymatous within; gleba yellow, then snuff-brown (drying bone-brown after preservation); septa 24–32 μ between hymenia, of loosely interwoven yellowish hyphae, scissile at the angles; basidia hyaline, broadly clavate, 3–4-spored with very slender sterigmata 5–7 μ long; spores yellow, broadly ovoid, rounded above, often pedicellate, exospore thick, sculptured by small, short ridges, uniguttulate, 12–13(–14.5) × 9.5–11(–14) μ.

In sandy soil, 7–10 cm. beneath the surface, under *Fraxinus oregana* and *Quercus agrifolia*. California. February and March.

CALIFORNIA: San Mateo County, Palo Alto, banks of Los Trancos Creek, near Stanford University, *James McMurphy 284, 292* type (Stanford, Zeller, and Dodge).

29. HYMENOGASTER DISCIFORMIS Hesse, Hypog. Deutschl. 1: 128. 1891; Sacc. Syll. Fung. 11: 171. 1895.

Type: location unknown to us.

Fructifications disciform, the size of a Bohemian "Hellerlinse" lentil, yellowish-white to cream-color; peridium thin, composed of floccose, swollen hyphae as in septa; gleba gray-white, becoming cream-color; basidia short, narrow-cylindrical, 2-spored; spores 12–16 × 5–7 μ, not apiculate, with a very short but fairly broad pedicel, ellipsoid, exospore wrinkled, brown-yellow.

In young woods of *Fagus* and *Quercus*. Hessen-Nassau, Germany. August to October.

30. HYMENOGASTER MINUSCULUS Soehner, Krypt. Forsch. **1**: 397. 1924.

Type: in Soehner Herb. but not seen by us.

Fructifications snow-white, becoming subfuscous, smooth, scarcely tuberous, up to 1 cm. in diameter, compact; peridium 120 μ thick; gleba at first white, then bay and inclining to reddish or lurid, cavities very small; basidia 2–4-spored, clavate, 20 × 9 μ; spores grayish-yellow, fusiform, 12–16 μ (rarely up to 20–25 μ) long, smaller spores 10 × 4–5 μ, not rare, exospore at first smooth, later slightly roughened by small furrows, utricle [? second membrane] absent.

Near München, Schleissheimer Schlosspark, Grünwald and Kaufbeuren in Schwaben.

Spores may vary between 7 and 25 μ in length in same fructification.

31. HYMENOGASTER VERRUCOSUS Bucholtz, Hedwigia **40**: 319. 1901; Материалы къ морфологіи и систематикѣ подземныхъ грибовъ . . . Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ с. Михайловскомъ Московской Губ. 158. 1902 [sometimes cited as Beitr. Morph. Syst. Hypog.]; Ann. Myc. **1**: 171. 1903; Sacc. & D. Sacc. in Sacc. Syll. Fung. **17**: 240. 1905.

Hymenogaster Rehsteineri Bucholtz, Hedwigia **40**: 318–319. 1901; *l. c.* 156. 1902; Ann. Myc. **1**: 171. 1903; Sacc. & D. Sacc. Syll. Fung. **17**: 239–240. 1905.

?*Hymenogaster decorus* Rehsteiner, Bot. Zeit. **50**: 764–771. 1892.—*not H. decorus* Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843.

Hymenogaster olivaceus f. *montana* Soehner, herb. nom.

Illustrations: Bucholtz, Материалы къ морфологіи и систематикѣ подземныхъ грибовъ . . . Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ с. Михайловскомъ Московской Губ. **1**: *pl. 3, f. 18, 19;* Ann. Myc. **1**: *pl. 5, f. 18–20;* ?Rehsteiner, Bot. Zeit. **50**: *pl. 10, f. 1–6.*

Type: of *H. verrucosus* and of *H. Rehsteineri* in Farlow Herb. at Harvard Univ., and in Berlin. The type of *H. olivaceus* f. *montana* in Soehner Herb. and Dodge Herb.

Fructifications irregular, spherical to subclavate, about 1.2 cm. in diameter, drying to 3–4 mm., light gray, then yellowish, drying drab, very hard; sterile base present; peridium 80–130 μ thick, composed of septate, compact hyphae which simulate prosenchyma; gleba brown, drying fuscous-black, cavities irregular, radiating from the base; septa yellowish, composed of loosely woven, parallel hyphae, with some vascular hyphae which stain blue with iodine; basidia 2-spored; spores ellipsoidal, broad at the ends, young spores obovoid to cylindrical, slightly apiculate, appendiculate, guttulate, 17–23 × 10–12.5 μ, epispore irregularly rugose-sinuose, yellow-brown, warts 0.5 μ high.

Under *Fagus, Tilia,* and *Picea.* Russia and mountains of Central Europe. April to August.

U. S. S. R. [Russia]: Moskva, Mikhailovskoe, *F. Bucholtz,* Aug. 8, 1899, Aug. 11, 1899, type of *H. Rehsteineri,* Aug., 1899, type of *H. verrucosus,* June 27, 1906, Aug. 25, 1907, July 22, 1910, Aug. 25, 1910, *4a, 4b, 5b* in part; *N. Mossolov,* Aug. 9, 1906; Senjkino, *F. Bucholtz,* July 28, 1906; Jasovka, *F. Bucholtz,* Apr. 24, 1907; Krasnaia Pachra, *F. Bucholtz,* July 29, 1907 (all Farlow).

Italy: Trentino, *G. Bresadola* (Upsala).

Germany: ?Bayern, Eddenberg Tusabeth, *E. Soehner 1035* (sub. *H. olivaceus f. montana* Soehner, herb. nom., Soehner).

France: Belfort, Delle, *L. Quélet* (sub. *H. pallidus,* Upsala).

32. Hymenogaster lilacinus Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843; DeToni in Sacc. Syll. Fung. **7**: 170–171. 1888; Hesse, Hypog. Deutschl. **1**: 116–117. 1891; Hollós, Magyar. Földalatti Gombai, 92–93, 205. 1911; Soehner, Zeitschr. f. Pilzk. **2**: 158. 1923; ?Verwoerd, S. Afr. Jour. Sci. **22**: 166. 1925.—*not* Berkeley, Brit. Fung. no. 305.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 33;* Tulasne, Fung. Hypog. *pl. 1, f. 2; pl. 10, f. 8.*

Type: in Tulasne Herb. at Paris and a fragment in Lloyd Mus. labeled "ex Tul. at Kew."

Fructifications spherical to irregular, silky, shining white, becoming dark gray; sterile base small, dirty white, branching; peridium thin, silky, shining white, becoming brown in air, drying submembranaceous, composed of thin-walled prosenchyma, fibrous next gleba, not separable; gleba lilac-colored,

becoming fuliginous; septa golden-yellow, composed of slender hyphae; basidia 2-spored, sterigmata 11 μ long; spores broadly ovoid to subacute ovoid-ellipsoid, obtuse or obtusely apiculate, nearly smooth but with somewhat wrinkled utricle, 18–24 × 12–14 μ, guttulate.

Known to us only from the type locality.

FRANCE: Seine, Vincennes, *Tulasne*, Oct., 1843 (Paris, and fragment Lloyd Mus.).

33. HYMENOGASTER EURYSPORUS Soehner, Krypt. Forsch. **1**: 296. 1924.

Type: in Soehner Herb. but not seen by us.

Fructifications ashy, later subfuscous and blackening, ovoid to spherical, floccose, the size of a chestnut; peridium very thin, composed of gelatinous hyphae; gleba whitish, yellowish, then fuscous on a cadmium-yellow background, deeper yellow in places, cavities very small; basidia clavate, 1–4-, mostly 2–3-spored, 30–40 × 10–12 μ; spores spherical at first, then broadly ovoid, without apiculus; exospore saccate, at first distended, later collapsed in transverse section, irregularly 3–6-angled, sculpturing 2–4 μ thick, pedicel 2.5–5 μ long; spores 18–25 μ long, with exospore 20–30 ×15–20 μ; ratio of length to breadth 4/3, at first deep bay then almost black.

In oak woods. Planegg-Gauting, Germany.

34. HYMENOGASTER OLIVACEUS Vittadini, Monogr. Tuberac. 24. 1831; Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843; Fung. Hypog. 69. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 876. 1883; DeToni in Sacc. Syll. Fung. **7**: 172. 1888; Massee, Ann. Bot. **4**: 45–46. 1889 [often cited as Monogr. Brit. Gast. 45–46. 1889]; Hesse, Hypog. Deutschl. **1**: 126–127. 1891.

Splanchnomyces Cordaeanus Zobel in Corda, Icones Fung. **6**: 42. 1854.

Splanchnomyces olivaceus Corda, Icones Fung. **6**: 44. 1854.

Splanchnomyces Broomeanus Corda, Icones Fung. **6**: *pl. 13, f. 107.* 1854 *(nomen nudum).*

Hymenogaster olivaceus var. *modestus* Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **18**: 74. 1846; Tulasne, Fung. Hypog. 71. 1851.

Hymenogaster decorus Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843; Fung. Hypog. 65. 1851; Cooke, Handbook Brit. Fung. **1**: 360–361. 1871; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 876. 1883; DeToni in Sacc. Syll. Fung. **7**: 169–170. 1888; Massee, Ann. Bot. **4**: 43–44. 1889 [often cited as Monogr. Brit. Gast. 43–44. 1889]; Hesse, Hypog. Deutschl. **1**: 115–116. 1891; Hollós, Magyar. Földalatti Gombai, 92, 205. 1911; Soehner, Zeitschr. f. Pilzk. **2**: 158. 1923.

Hymenogaster pallidus Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **18**: 74. 1846; Tulasne, Fung. Hypog. 68. 1851; Cooke, Handbook Brit. Fung. **1**: 361. 1871; DeToni in Sacc. Syll. Fung. **7**: 173. 1888; Hesse, Hypog. Deutschl. **1**: 131. 1891.

Hymenogaster calosporus Tulasne, Fung. Hypog. 70. 1851; DeToni in Sacc. Syll. Fung. **7**: 169. 1888; Hesse, Hypog. Deutschl. **1**: 129–130. 1891; Th. M. Fries, Svensk Bot. Tidskr. **3**: 278–279. 1909; Th. C. E. Fries, Ark. f. Bot. **17**^{9}: 14. 1921; Soehner, Zeitschr. f. Pilzk. **2**: 158. 1923.

Illustrations: Bucholtz, Ber. Deut. Bot. Ges. **15**: *pl. 6, f. 10–13;* Corda, Icones Fung. **6**: *pl. 8, f. 80; pl. 13, f. 107;* Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 32, 34;* Massee, Ann. Bot. **4**: *pl. 1, f. 15–18;* Tulasne, Fung. Hypog. *pl. 10, f. 4, 9;* Vittadini, Monogr. Tuberac. *pl. 3, f. 5; pl. 5, f. 5, f. 9c.*

Type: material in Broome Herb., Berkeley Herb., and Fries Herb. Type of *H. decorus* was not found, but "France, Seine, Vincennes, *Tulasne,* Oct., 1845" is in Tulasne Herb., Berkeley Herb., and Broome Herb. and represents very mature specimens. The type of *H. pallidus* (England, Northamptonshire, Cotterstock, *M. J. Berkeley*) is found at Kew, with a small fragment showing spores only, in Paris, and in Lloyd Mus. The type of *H. calosporus* (France: Seine, Vincennes, Coteau de Beauté, *Tulasne,* Oct., 1845) is found in Paris, with one small specimen in Berkeley Herb. at Kew, and represents very young specimens.

Fructifications up to 4 cm. in diameter, subglobose to irregular, pallid, becoming dirty brown, drying bister to fuscous, surface smooth to innate-fibrillose, often rupturing deep into

the gleba; peridium 75–150 μ thick, homogeneous, of large, thin-walled, varicose hyphae; gleba mottled tawny and white, becoming dirty brown, drying snuff-brown to bone-brown, cavities irregular, medium small; septa 20–30 μ thick, hyaline, of gelified interwoven hyphae; basidia slender, cylindrical, 2-spored; spores smooth when young, covered with a clear, more or less closely applied utricle, obovoid-lanceolate with a cylindrical or capitate apiculus, prominent claw-like pedicel, 29–42 × 11–14 μ, light yellowish-brown, guttulate with prominent epispore, mature spores dark ellipsoid with rounded ends, with a loose, much-wrinkled utricle, guttulate with a prominent epispore, 19–29 × 12–14 μ.

Hypogeous under deciduous or coniferous trees. Europe and the Pacific Coast of the United States. April to January.

The long-standing concept of lanceolate spores in *H. olivaceus, H. calosporus,* and *H. pallidus* represents the immature stage of spores of *H. olivaceus,* and the broad, oblong spores of *H. decorus* as illustrated by Tulasne represent the mature stage of spores of *H. olivaceus.* In several cases from widely distributed localities, typical spores of *H. calosporus* were observed to be associated with typical spores of *H. decorus* in the same fructification, even in the same glebal cavities. As the spores mature they become shorter, the apiculus shrivels and disappears, while the utricle becomes roughly wrinkled and darker as the spore contracts.

U. S. S. R. [Russia]: Moskva, Mikhailovskoe, *F. Bucholtz,* July 22, 1906, Aug. 21, 1907, *6A,* Aug. 25, 1910; *K. P. Sheremetev,* Aug. 24, 1906 (all sub *H. verrucosa,* Farlow); Ukraine [near Kharkov], *B. M. Czernaiev* (sub *H. vulgaris,* Kew).

Lithuania: Kaunas [Kovno], *Domradsky,* Aug., 1904 (Farlow).

Sweden: Uppland, Upsala, *E. Fries* (sub *Octaviania Pisomyces,* Kew); Karolinaparken, *Th. M. Fries,* Aug., 1883, Aug. 19, 1883; Botaniska Trädgård, *Th. C. E. Fries,* Aug., 1889, Jan. 20, 1906 (all Upsala).

Germany: Bayern, München, *E. Soehner 1025* (Soehner); Hessen-Nassau, Kirchditmold, *E. Hesse,* Apr., 1890 (Hesse).

Italy: Trentino, *G. Bresadola,* Aug., 1882 (Upsala); Lombardia, Milano, *C. Vittadini* (Brit. Mus. and Upsala).

France: Seine, Vincennes, Coteau de Beauté, *Tulasne,* type of *H. calosporus* and type of *H. decorus* (Brit. Mus. and Paris).

England: Essex, Audley End, *G. E. Leafe* (Kew); Epping Forest, [*C. E. Broome?,* ex Broome Hb. in Currey Hb., Brit. Mus.]; Norfolk, [Kings Lynn?],

C. B. Plowright, Nov., 1879, (Brit. Mus.); Northampton, Cotterstock, *M. J. Berkeley*, type of *H. pallidus* (Kew); Rushton, *M. J. Berkeley*, Aug. 19, 1848 (Kew); Wiltshire, Bowood, *C. E. Broome*, Oct. 4, 1843 (Brit. Mus.); Hartham Park, *C. E. Broome*, 1845, type of *H. citrinus* var. *modestus* (Brit. Mus.); Oct. 29, 1845 (Kew); Rudloe, *C. E. Broome*, May 17, 1843 (dist. as *H. citrinus* Berkeley, Brit. Fung., 284), May, 1843 (dist. as *H. populetorum*, *Ibid.*, 304 [or perhaps these came from Lucknam, May, 1843, as this set was issued without localities] Brit. Mus., etc.); *C. E. Broome*, May, 1848 (Brit. Mus.); Castle Coombe, *C. E. Broome*, Nov., 1843 (Brit. Mus); †Gloucester, Blaize Castle [*C. E. Broome*], Nov. 17, 1867 (Brit. Mus.); Bedminster Down near Bristol, *C. E. Broome 309* (J. W. Bailey Herb. at Brown Univ.); near Wootton under Edge, *C. E. Broome*, Oct. 26, 1882 (Brit. Mus.); Southmead near Bristol, *G. H. K. Thwaites*, Sept. 4, 1845 (Brit. Mus.); Tan Pits near Bristol, *C. E. Broome*, Oct. 14, 1847 (Brit. Mus.); near Bristol, *C. E. Broome*, Sept. 11, 1845 (J. W. Bailey Herb. at Brown Univ.); Somerset, Batheaston, *C. E. Broome*, Dec., 1858 (sub *H. citrinus* var. *modestus*, Brit. Mus.); N. Wootton, *C. E. Broome*, Aug., 1880 (Brit. Mus).

OREGON: Benton County, Corvallis, *L. M. Boozer 37* (Oregon State 5829); Linn County, *S. M. Zeller 2589* (Zeller).

CALIFORNIA: Alameda County, Berkeley, *N. L. Gardner 222, 253;* Marin County, Ross Valley, toward base of Eldredge Grade on Mt. Tamalpais, *W. A. Setchell & C. C. Dobie* (com. N. L. Gardner 9); Santa Cruz County, Felton Big Trees, *H. E. Parks 503* (all Univ. Cal. and Zeller).

35. HYMENOGASTER VULGARIS Tulasne in Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **18**: 74. 1846; Fung. Hypog. 67. 1851; DeToni in Sacc. Syll. Fung. **7**: 175. 1888; Massee, Ann. Bot. **4**: 44. 1889 [often cited as Monogr. Brit. Gast. 44. 1889]; Th. M. Fries, Svensk Bot. Tidskr. **3**: 276–278. 1909; Hollós, Magyar. Földalatti Gombai, 91–92, 204–205. 1911; Th. C. E. Fries, Ark. f. Bot. **17**^{9}: 14. 1921; Soehner, Zeitschr. f. Pilzk. **2**: 158. 1923.—*not* Hesse, Hypog. Deutschl. **1**: 114–115. 1891.

Rhizopogon albus Fries, Syst. Myc. **2**: 293–294. 1823, excl. syn.

Hymenogaster albus Fries, Summa Veg. Scand. **2**: 436. 1849.—*not* Berk. & Broome, Ann. & Mag. Nat. Hist. I. **13**: 349. 1844.

Hymenogaster griseus Tulasne, Ann. Sci. Nat. Bot. II. **19**: 374. 1843.—*not* Vittadini, Monogr. Tuberac. 23. 1831.

Splanchnomyces Tulasneanus Zobel in Corda, Icones Fung. **6**: 43. 1854.

Hymenogaster ? campester Becker, Natur **35**: 355. 1886.

Hysterangium australe Spegazzini, Anal. Soc. Cient. Arg.

11: 242–243. 1881 [often cited as Fung. Arg. 4: 94. 1881]; DeToni in Sacc. Syll. Fung. 7: 157–158. 1888.

Hymenogaster australis Spegazzini, Anal. Soc. Cient. Arg. 29: —. 1887 [reprinted as Truf. Arg. 6–8. 1887]; Rev. Myc. 10: 107. 1888; Lloyd, Myc. Notes 66: 1120. 1922.

Hymenogaster limosus Hesse, Hypog. Deutschl. 1: 133. 1891; Sacc. Syll. Fung. 11: 171. 1895.

Hymenogaster tener var. *arbuticola* P. Hennings, Verh. Bot. Ver. Prov. Brandenburg 40: 146. 1898; Sacc. & Sydow in Sacc. Syll. Fung. 16: 254. 1902; Soehner, Hedwigia 64: 200. 1923.

Hymenogaster arenarius forma *austriacus* Bucholtz, herb. nom.

Illustrations: Bucholtz, Материалы къ морфологіи и систематикѣ подземныхъ грибовъ . . . Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ С. Михайловскомъ Московской губ. 1: *pl. 4, f. 26;* Corda, Icones Fung. 6: *pl. 13, f. 108; pl. 8, f. 84;* Hennings, Verh. Bot. Ver. Prov. Brandenburg 40: *pl. 1, f. 19;* Hesse, Hypog. Deutschl. 1: *pl. 7, f. 42;* Tulasne, Ann. Sci. Nat. Bot. II. 19: *pl. 17, f. 1–3;* Fung. Hypog. *pl. 10, f. 10.*

Type: no specimen designated by Tulasne. "France, Seine, Bois de Boulogne, *Tulasne*" in Paris and in Broome Herb. may be considered the type. *Hymenogaster campester* based on "Pilsnitz near Breslau, *L. Becker,* 18 Mai, 1893" in Bot. Mus. Berlin. *Hysterangium australe* and *Hymenogaster australis* based on "Boca de Riachuelo, Argentina, *C. Spegazzini,* May and July, 1881," fragment in N. Y. Bot. Gard. Herb.

The type of *H. limosus* Hesse has not been seen by us but is stated by E. Soehner to be the same as *H. campester.* No specimen of *H. tener* var. *arbuticola* has been designated as the type, there being eight specimens in Berlin which were all in Hennings' collection before he described the variety. Five of these were studied, and all seem to be stages in the development of *H. vulgaris.* The only possible specimen which could be considered the type of *Rhizopogon albus* Fr. is "Skåne, *E. Fries*" at Upsala and in Berkeley Herb. which may not have been collected until years after the description was written, as Fries states that it was described from living material.

Fructifications spherical to costate-sulcate and irregular, about the size of a filbert, white, becoming dirty white; sterile base often prominent; peridium about ½ mm. thick, drying 85–120 μ, separable with difficulty, smooth, silky, composed of compact hyphae; gleba white, becoming lilac, fuscous, dark brown, and often black, cavities variable in shape, empty; septa 40–45 μ thick, highly gelified; basidia cylindrical, 2-spored; spores oblong to fusiform, acute at apex, attenuate toward base, pale fuscous-yellow, slightly roughened, utricle longitudinally diagonally wrinkled, 22–33 × 9–14.8 μ.

Under moss in woods. Europe and North and South America. Spring and summer.

U. S. S. R. [RUSSIA]: Moskva, Mikhailovskoe, *K. P. Sheremetev*, Aug. 9, 1906; *E. Sheremetev*, Aug. 12; *F. Bucholtz, 8a*, Aug. 23, 1907, Aug. 25, 1910; road to Pleskovo, *F. Bucholtz*, July 29, 1906, Aug. 20, 1907, Aug. 28, 1907; Binderwirt b. d. Rasalpi, *F. Bucholtz*, June 23, 1905 (all Farlow).

FINLAND: Mustiala, *P. A. Karsten 484*, 1866–1867, distributed as Fung. Fenn., 484.

SWEDEN: Uppland, Enköping, Lidehäll, *C. J. Cederström*, Sept. 9, 1889 (Upsala); *E. Nyman*, Sept. 10, 1891, Skåne, *E. Fries* (Upsala, Kew).

AUSTRIA: between Prein and Simmering over the Eselbachsgrabern, *F. Bucholtz, 49, 50* (sub *H. arenarius* f. *austriacus* Bucholtz, von Hoehnel Herb. at Farlow).

GERMANY: Berlin, Botanischer Garten, *P. Hennings*, May 15, 1889, April 13, 1891, May 22, 1891, April 5, 1893 (all sub *H. tener* var. *arbuticola* Hennings, type not designated in Berlin); Bayern, München, *E. Soehner*, July 6, 1925 (Soehner); Sendling, *E. Soehner, 1020, 1021, 1022, 1023* (Soehner); Pilsnitz near Breslau, *L. Becker*, type of *H. campester* (Berlin).

FRANCE: Jura Sept., Montagne du Lomont, *L. Quélet* (Upsala); Seine, Bois de Boulogne, *Tulasne*, Mar. 16, 1846, type, Apr. 17, 1846 (Paris).

ENGLAND: KENT: Darenth Wood, *C. E. Broome*, Nov., 1869 (Brit. Mus.); *C. E. Broome*, Oct. 29, 1845 (Brit. Mus.); GLOUCESTERSHIRE: Tan Pits near Bristol, Oct. 14, 1847, *C. E. Broome* (Berk. Herb., Broome Herb., and two collections in Brown Univ. sub *H. tener*, one N. Y. Bot. Gard. sub *H. mutious*); Bentham Wood Hill, Oct. 6–10, 1859 (Currey Herb. at Brit. Mus.); Leigh Wood near Bristol, *C. E. Broome*, Oct. 30, 1879 (Brit. Mus.); Kingsweston near Bristol, Sept. 11, 1845 (Brit. Mus.); Stapleton Grove near Bristol, *C. E. Broome* (Brit. Mus.); WILTSHIRE: Hartham Park, Rudloe, *C. E. Broome*, distributed in Berkeley, Brit. Fungi, 305 *pro parte majore* (type distribution of *H. tener*, originally sub *H. lilacinus*, most of the material being *H. vulgaris*, but one specimen seen was true *H. tener*); Corsham House, *C. E. Broome*, Nov. 9, 1843; Lucknam, *C. E. Broome*, Sept. 20, 1859; SOMERSET: Batheaston, *C. E. Broome*, Nov., 1859 (all Brit. Mus.).

NEW YORK: near Ithaca, *H. M. Fitzpatrick 1119* (Cornell and Zeller).

OREGON: Linn County, Foster, *S. M. Zeller 8185* (Zeller).

ARGENTINA: Boca Riachuelo, *C. Spegazzini*, type of *H. australis* (N. Y. Bot. Gard.).

36. HYMENOGASTER GILVUS Hesse, Hypog. Deutschl. **1**: 117. 1891; Sacc. Syll. Fung. **11**: 170–171. 1895.

Type: location unknown to us.

Fructifications scarcely the size of a hazelnut, irregular, often with a deep furrow at the base, whitish to faded yellow; peridium scarcely a line thick, fibrous without and within, with a middle layer of small-celled pseudoparenchyma; gleba greenish-yellow, cavities narrow and not very long but still visible without a lens; septa yellowish; basidia brownish, 2-spored, projecting beyond the septate paraphyses; spores 18–21 × 10–12 μ, similar to *H. Hessei* but narrower and longer; appendiculus 2–2.5 μ long, apiculate, exospore wrinkled and dark brown.

Under *Quercus* and *Fagus*. Hessen-Nassau, Germany. August to October.

37. HYMENOGASTER POPULETORUM Tulasne, Ann. Sci. Nat. Bot. II. **19**: 375. 1843; Fung. Hypog. 66. 1851; DeToni in Sacc. Syll. Fung. **7**: 173. 1888; Hesse, Hypog. Deutschl. **1**: 119. 1891; Hollós, Magyar. Földalatti Gombai, 93–94, 205. 1911.—*not* Berkeley, Brit. Fung. 304.

Splanchnomyces populetorum Corda, Icones Fung. **6**: 42. 1854.

Illustrations: Tulasne, Fung. Hypog. *pl. 10, f. 10;* Corda, Icones Fung. **6**: *pl. 8, f. 83;* Hesse, Hypog. Deutschl. **1**: *pl. 5, f. 12.*

Type: in Berkeley Herb., fragment of type in Lloyd Mus.

Fructifications irregular, the size of a small walnut or filbert, smooth to innate-fibrillose, white, becoming dirty yellow and finally dark brown; sterile base scarcely visible; peridium thin, 75–100 μ, not separable but frequently eaten off, loosely stupose, hyaline with very thin darker rind; gleba brown, sometimes becoming almost black, fragile; septa 30–40 μ thick, composed of slender, hyaline, compact hyphae; basidia 2-spored, quickly gelifying; spores 18.5–26 × 10–18.5 μ, usually obtuse at the apex, ellipsoid, obovoid or ovoid, slightly appendiculate, utricle slightly roughened at maturity, brown.

In beech forest. France. Summer and autumn.

FRANCE: Doubs, Hérimoncourt, *L. Quélet*, June, July, 1880 (Upsala); Vienne, Loudun, Sablières de Condé, *Tulasne*, Oct., 1841, type (Kew and Paris).

38. Hymenogaster reniformis Hesse, Hypog. Deutschl. 1: 119. 1891; Sacc. Syll. Fung. 11: 171. 1895.

Type: location unknown to us.

Fructifications the size of a pea or smaller, reniform, amber-yellow, smooth above; peridium scarcely a line thick, composed of very slender, gelified hyphae; gleba somewhat fleshy and yellowish, cavities small but visible to the naked eye; septa yellow, composed of thin-walled, slender hyphae; basidia narrow, 2-spored, not projecting much beyond the paraphyses; spores 16–20 × 8–10 μ, with a short, blunt apiculus, appendiculus 1 × 1 μ, exospore wrinkled, dark yellow.

In sandy soil under *Fagus*. Hessen-Nassau, Germany. August to October.

The spores are near those of *H. lilacinus* Tul. but are narrower, and the appendiculus is thinner.

39. Hymenogaster **occidentalis** Zeller & Dodge, sp. nov.

Fructificationes laeves, 1–2 cm. diametro metientes, subsphericae, rugosae vel sulcatae, "pale tan" rubro-maculatae recens, "pinkish buff" vel "clay color" siccatae; peridium byssoideum, stuposum, fibrillosum, hyalinum, 50–100 μ crassitudine; gleba grisea, "snuff-brown" siccata, locellis magnis; septa fragilia, tenuia, 15–19 μ (ad 74 μ hymeniis inclusis) crassitudine, prosenchymatica, sublutea siccata; basidia cylindrica, angusta, 30–34 × 4–5 μ, 2- vel 4-spora; sporae ellipsoideae, sublatae, apiculatae vel rotundatae in aliquantulis sporis maturis, pedicello brevi, utriculo laevi, episporio verrucoso, 20–26 × 12–15 μ; odor terreus.

Type: in Zeller and Dodge Herbaria.

Fructifications smooth to silky, 1–2 cm. in diameter, sulcate-rugose to subglobose, pale tan, flecked with small patches of pink or red, drying pinkish-buff to clay-colored; peridium of a byssoid, stupose, or meshy fibrillose texture, hyaline, 50–100 μ thick; gleba grayish, drying snuff-brown, cavities relatively large; septa brittle, thin, papery, 15–19 μ thick (74 μ including hymenia), prosenchymatous, hyaline to yellowish when dry; basidia cylindrical, narrow, 30–34 × 4–5 μ, 2- or 4-spored; spores mostly ellipsoid, slightly broad-apiculate, sometimes maturing with a broad rounded tip, pedicel notched, short, surface warted (warts mostly retrorse) and covered by a smooth utricle, 20–26 × 12–15 μ. Odor earthy.

Scattered through loose moist soil under *Quercus* or *Abies*. Oregon and California. March to May.

Type: in Dodge and Zeller Herbaria.

OREGON: Benton County, Corvallis, *S. M. Zeller 6814*, type (Dodge and Zeller); Linn County, Foster, *S. M. Zeller 8186* (Zeller).

CALIFORNIA: Santa Clara County, Guadaloupe Mines, *H. E. Parks 431* (Dodge); Humboldt County, Trinidad, *H. E. Parks 4127* (Zeller).

40. HYMENOGASTER THWAITESII Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **18**: 75. 1846; Tulasne, Fung. Hypog. 71. 1851; Berkeley, Outlines Brit. Fungol. 297. 1860; DeToni in Sacc. Syll. Fung. **7**: 174–175. 1888; Massee, Ann. Bot. **4**: 47–48. 1889 [often cited as Monogr. Brit. Gast. 47–48. 1889]; Hesse, Hypog. Deutschl. **1**: 125–126. 1891.

Illustrations: Berkeley, Rept. & Trans. Birmingham Nat. Hist. Soc. **1881**: *pl. 3, f. 14;* Massee, Ann. Bot. **4**: *pl. 1, f. 25* [Monogr. Brit. Gast. *pl. 1, f. 25*]; Tulasne, Fung. Hypog. *pl. 10, f. 11.*

Type: in Berkeley Herb. at Kew.

Fructifications small, about the size of a pea, firm, dirty white, stained brown; peridium thin, 110–120 μ thick, smooth, composed of hyaline, very slender hyphae; gleba whitish, becoming brown, cavities elongated; septa thin and white; basidia slender, cylindrical, 2-spored; paraphyses broad, septate, hyaline; spores dark reddish-brown, rarely with a very small, blunt apiculus, obovoid or nearly spherical, 22 × 14 μ, rather rough or undulating-verrucose, often slightly appendiculate.

Rare under *Quercus* and *Fagus*. England. September to November.

ENGLAND: Portbury, *G. H. K. Thwaites*, Sept. 6, 1845, type (Berk. Herb., not Hooker Herb., at Kew); Kent, Tunbridge Wells, Oct., 1859 (sub *H. Klotzschii* at Kew).

41. HYMENOGASTER ALBELLUS Massee & Rodway, Kew Bull. Misc. Inf. **1898**: 126. 1898; Sacc. & Sydow in Sacc. Syll. Fung. **16**: 253–254. 1902; Rodway, Papers & Proc. Roy. Soc. Tasmania **1911**: 28. 1912; **1923**: 152. 1924.

Hymenogaster luteus Harkness, Proc. Cal. Acad. Sci. Bot. III. **1**: 247. 1899—*not* Vittadini, Monogr. Tuberac. 22. 1831.

Type: in Kew Herb.

Fructifications subspherical, 2–3 cm. in diameter, white, turning yellowish to light buff, drying yellow-ochre or ochraceous-buff, surface innate-fibrous, drying rugose; peridium thin, 18–30 μ thick, hyaline, the outer part composed of loosely applied, yellowish hyphae, the inner portion of more compact, stupose hyphae; gleba becoming fragile, Sudan brown to Argus brown, cavities irregular; septa thin, fragile, 12–25 μ thick, composed of hyaline, thin-walled, parallel hyphae; basidia 2-spored, broad-cylindric, 11–13 × 15–18 μ, sterigmata short, about 2–3 μ long; spores ellipsoid-citriform, apiculate, roughened by an evenly applied, alveolate utricle which extends to the base of the apiculus, dark brown (the young spores smooth, ellipsoid), 9.6–11.1 × 14.5–17 μ, including utricle.

Common in the southern hemisphere, also in California and Oregon. Under *Quercus*. October, in Oregon.

The young spores, where no utricle is developed, are smooth, ellipsoid, with no apiculus but usually with a pedicel attached. In some apparently semi-mature spores the utricle is less closely applied above, having a flaring tendency.

California: *H. E. Parks 1063*, 1929; Humboldt Co., Eureka, *Joseph P. Tracy* (com. H. E. Parks 4621); Alameda County, Berkeley, *N. L. Gardner 61, 69, 90, 119, 120, 238; G. Hahn* (com. N. L. Gardner 460); Oakland, *H. W. Harkness 12* (all sub *H. luteus*, Stanford); San Francisco, Parnassus Heights, *R. H. Kelley* (com. N. L. Gardner 23); *W. A. Setchell & C. C. Dobie* (com. N. L. Gardner 24); Santa Clara County, Alma, *H. E. Parks 1030* (all, except *Harkness 12*, Univ. Cal. and Zeller).

Oregon: Benton County, Corvallis, *S. M. Zeller 2563, 2565* (Zeller); *H. M. Gilkey* (Oregon State 5590, Zeller 8130); Linn County, *S. M. Zeller 2587;* Foster, *S. M. Zeller 7954* (both Zeller).

Brazil: *F. Rick 327* (Lloyd Mus.).

Uruguay: Montevideo, Sayago, 30 m., *G. Herter 3340, 3348a* (Berlin).

Chile: Magellanes, Punta Arenas, *R. Thaxter, Hymenogast. 1* (Farlow).

Tasmania: *L. Rodway 117*, type (Kew), *585, 1285* (Dodge); Cascades, *L. Rodway*, July, 1920 (Dodge).

New Zealand: Wellington, Palmerston North, *G. H. Cunningham 1141* (Dodge).

South Africa: Stellenbosch, *A. V. Duthie 209* (Lloyd Mus.).

42. Hymenogaster javanicus Hoehnel, Sitzb. K. Akad. Wiss. Wien 117[1]: 1017. 1908; Sacc. & Trotter in Sacc. Syll. Fung. 21: 495. 1912.

Illustrations: Hoehnel, Sitzb. K. Akad. Wiss. Wien 117[1]: 1018.

Type: location unknown to us, probably non-existent.

Fructifications spherical or depressed, 0.7 × 0.9 cm., ochraceous; sterile base 2.5 × 1.5 mm. thick; peridium not separable, 350–400 μ thick, duplex, the outer layer loosely woven, of thick-walled, yellow-brown, septate hyphae, 5–11 μ in diameter, with swollen tips, the inner layer about 80 μ thick, pseudoparenchymatous, composed of thin-walled, hyaline cells 16 μ in diameter; gleba chocolate-color, cavities radially arranged from the base, up to 1.2 mm. long, about 0.4 mm. in diameter; septa about 120 μ thick, composed of thin-walled hyphae 4–6 μ in diameter, with pseudoparenchymatous subhymenial layer; basidia 26–28 × 10–14 μ, cylindrical, sterigmata 20 × 4 μ; spores brown, almost citriform, with a short hyaline apiculus, 17–18 × 10–12 μ, epispore fine-warted, covered by a smooth utricle.

In the forest at Tjibodas, Java.

This species is very close to *H. albellus,* from which it differs in its much larger dimensions. However, the fact that this description may have been drawn up from fresh specimens or from those preserved in alcohol, while we have seen largely dry material in *H. albellus,* may be sufficient to account for the discrepancy. The specimen, "Magellanes, Chile, *R. Thaxter,*" which has been preserved in alcohol and which we unhesitatingly referred to *H. albellus* shows measurements very closely approximating Hoehnel's measurements of *H. javanicus.*

43. HYMENOGASTER SULCATUS Hesse, Hypog. Deutschl. **1**: 111. 1891; Sacc. Syll. Fung. **11**: 170. 1895; Soehner, Zeitschr. f. Pilzk. **2**: 157. 1923.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 27.*

Type: in Bot. Inst. Univ. Marburg.

Fructifications under 1 cm. in diameter, very irregular, at first yellow, then dark red-brown, becoming blue-gray in alcohol, with a characteristic deep groove at the base, along which the portions of the fructification easily separate and grooves also traverse the surface; peridium 80–100 μ thick (dry), the outer part composed of loosely woven hyphae, the middle part of compact prosenchyma; gleba brownish-yellow, cavities small, nearly filled with spores; septa 25–37 μ thick, composed

of loosely woven hyphae; basidia long and slender, 2-, rarely 3-,spored, much longer than the paraphyses, brown; paraphyses broad; spores 24–36 × 10–16 μ, with a short, blunt apiculus, long-appendiculate, exospore very thin, covered with small flakes.

In the humus layer under *Quercus* and *Fagus,* along with *Hysterangium calcareum.* Central Europe and Oregon. April to October.

U. S. S. R. [RUSSIA]: Moskva, Mikhailovskoe, and road to Sekirino, *F. Bucholtz,* Aug. 25, 1907 (sub *H. vulgaris* a and *H. tener* a, Farlow); Ukraine [near Kharkov], *B. M. Czernaiev* (sub *H. vulgaris,* det. Berkeley, Upsala).

GERMANY: Kirchditmold, *R. Hesse,* V, 1889, type, and IV, 1890; Stadtwald, *R. Hesse,* VIII, 1890 (both Hesse); Bad Vorisshofen, *E. Soehner 488* (Soehner).

WALES: Nant y Glyn, *C. E. Broome,* Oct., 1880 (Brit. Mus.).

OREGON: Benton County, Corvallis, *S. M. Zeller 2425* (Zeller).

44. HYMENOGASTER HESSEI Soehner, Zeitschr. f. Pilzk. 2: 158. 1923.

Hymenogaster vulgaris Hesse, Hypog. Deutschl. 1: 114–115. 1891—*not H. vulgaris* Tulasne.

Illustrations: Hesse, Hypog. Deutschl. 1: *pl. 2, f. 14–15; pl. 7, f. 30.*

Type: in Bot. Inst. Univ. Marburg.

Fructifications the size of a hazel-nut, irregular, base remaining sterile for a long time, white to dirty gray; peridium shining, papery, drying 18–26 μ thick, not separable, composed of pseudoparenchyma in the middle and a fibrous layer next the gleba; gleba white, becoming brown to blackish, cavities irregular; septa 18–20 μ thick, composed of loosely woven hyphae; basidia of medium size, cylindric, surpassing the paraphyses in length, 2-spored; spores broad obovoid-citriform with a very roughly wrinkled utricle, golden-yellow when young, then darker, 16–22 × 10–15 μ, appendiculus 1.5 μ long and 2.5 μ broad, like a pair of claws, apiculus short, blunt.

Under *Quercus* and *Fagus.* Hessen-Nassau, Germany. August to October.

The young spores of *H. verrucosa* Bucholtz are of the same magnitude and shape as mature spores of *H. Hessei,* and might be mistaken for the latter. However, the spores of *H. verru-*

cosa are provided with a finely verrucose epispore covered with a rather closely applied utricle, so that the young spores appear finely beaded, while in *H. Hessei* the utricle is dark and roughly wrinkled.

GERMANY: Hessen-Nassau, Marburg, Caldernesstrasse, *R. Hesse*, Oct. 6, 1886, type (Hesse).

45. HYMENOGASTER **fusisporus** (Massee & Rodway) Zeller & Dodge, comb. nov.

Hysterangium fusisporum Massee & Rodway, Kew Bull. Misc. Inf. **1898**: 127. 1898; Sacc. & Sydow in Sacc. Syll. Fung. **16**: 247. 1902; Rodway, Papers & Proc. Roy. Soc. Tasmania **1911**: 26. 1912; **1923**: 155. 1924.

Hymenogaster Barnardi Rodway, Papers & Proc. Roy. Soc. Tasmania **1920**: 157. 1921; *fide* Rodway, *Ibid.* **1923**: 161. 1924.

Type: in Kew Herb.

Fructifications 0.5–2 cm. in diameter, subglobose to irregular, surface cottony to innate-stupose, white to straw-color, drying cream-buff; peridium thin, 25–80 μ thick, continuous with the septa and not easily separable, hyaline, cottony-stupose; slight sterile base; gleba rather dense, with small sinuous cavities, pallid, drying maize-yellow to apricot-yellow; septa thin, 8–15 μ thick, fragile, hyaline, stupose; basidia 2-spored, sterigmata short; spores hyaline or dilute yellowish, fusiform, acute at both ends, 20–22 × 8–9 μ, smooth, with slight apiculus, epispore inconspicuous.

Hypogeous. Tasmania.

TASMANIA: *L. Rodway 276* type (Kew), *1113*, *1271* (as *H. Barnardi* Rodway, Dodge and Zeller); Hobart, *L. Rodway* (Lloyd Mus. 084); Cascades, *L. Rodway 1119* (Lloyd Mus.).

46. HYMENOGASTER TOMENTELLUS Hesse, Hypog. Deutschl. **1**: 112. 1891; Sacc. Syll. Fung. **11**: 170. 1891.

Type: location unknown to us.

Fructifications the size of a hazel-nut, irregular, yellowish-white when young, becoming brownish, finally golden-yellow and somewhat shining; peridium very thin, fibrous, composed of very slender hyphae, not separable; gleba red-brown, cavities small; septa thin and whitish-yellow, composed of septate,

branched, somewhat gelified hyphae; basidia narrow-cylindric, 2-spored, extending slightly above the paraphyses, brownish; spores citriform, with long, blunt, hyaline apiculus, and wrinkled exospore, golden-yellow to dark red-brown, usually appendiculate, 27–29 × 11–13 μ.

In calcareous earth under *Fagus* and *Quercus*. Hessen-Nassau, Germany. August to October.

47. HYMENOGASTER **Parksii** Zeller & Dodge, sp. nov.

Fructificationes spongiosae, laeves, subsphericae, 0.5–1.5 cm. diametro metientes, sordide albidae vel griseae, "cinnamon buff" vel "clay color" siccatae; peridium 35–75 μ crassitudine, byssoideum, stuposum, facile laceratum; gleba grisea, "Natal brown" siccata; septa 18–25 μ crassitudine, stuposum, compactum; basidia 4-spora, cylindrica; sporae maturae nigerrimae, verrucosae, obovoideae vel late ellipsoideo-citriformes, 18.5–26 × 12.2–17 μ, sporae immaturae laeves, flavae ut in *H. citrino* aut in *H. Bulliardi*, 22–24 × 11–14 μ, apiculatae pedicellataeque.

Type: in Univ. Cal., Dodge, and Zeller Herbaria.

Fructifications soft, spongy, smooth, subspherical, 0.5–1.5 cm. in diameter, dirty white to gray, becoming cinnamon-buff to clay-color on drying; peridium 35–75 μ thick, cottony-stupose, hyaline, easily torn; gleba grayish, drying Natal brown, cavities first developing above; septa 18–25 μ thick, coarse-stupose, compact; basidia 4-spored, cylindrical; spores very dark, verrucose at maturity, obovoid- or broadly ellipsoid-citriform, young spores smooth, clear yellowish, and resembling *H. citrinus* when narrow or *H. Bulliardi* when broad, mature spores 18.5–26 × 12.2–17 μ, young spores 22–24 × 11–14 μ, apiculate and pedicellate.

Scattered just under leaves and through the soil about 5 cm. deep under *Quercus* and *Heteromeles arbutifolia*. California. November to April.

CALIFORNIA: Santa Clara County, Guadaloupe Mines, *H. E. Parks 432, 950* type (Univ. Cal., Dodge and Zeller); San Mateo County, Lower Los Trancos Creek, Palo Alto, *James McMurphy 276*, Jasper Ridge, Palo Alto, *J. McMurphy 300* (Stanford and Zeller).

48. HYMENOGASTER ARENARIUS Tulasne, Giorn. Bot. Ital. 1²: 55. 1844; Fung. Hypog. 73. 1851; DeToni in Sacc. Syll. Fung. 7: 168. 1888; Soehner, Hedwigia 64: 192–202. 1923.

Hymenogaster pusillus Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **18**: 75. 1846; Tulasne, Fung. Hypog. 73. 1851; Cooke, Handbook Brit. Fung. **1**: 363. 1871; De Toni in Sacc. Syll. Fung. **7**: 173. 1888; Massee, Ann. Bot. **4**: 48–49. 1889 [often cited as Monogr. Brit. Gast. 48–49. 1889]; Hesse, Hypog. Deutschl. **1**: 125. 1891; Hollós, Magyar. Földalatti Gombai, 94–95, 206. 1911; Soehner, Hedwigia **64**: 192–202. 1923.

Hymenogaster Suzukianus Hennings, Bot. Jahrb. [Engler] **32**: 41. 1902; Sacc. & D. Sacc. in Sacc. Syll. Fung. **17**: 240. 1905.

Illustrations: Soehner, Hedwigia **64**: 196; Tulasne, Fung. Hypog. *pl. 10, f. 2;* Massee, Ann. Bot. **4**: *pl. 1, f. 21.*

Type: France, Seine, Bois de Boulogne, *Tulasne.* Original collection not found but material from the same locality collected a little later is abundant in Paris and agrees closely with the description and figures. Type of *H. pusillus,* "England, Rushton, Berkeley, Oct. 8, 1845," at Kew, mostly eaten by insects. Judging from the size of the glue spots, about 2 mm. in diameter, one specimen shows trace of a sterile base and one of the peridium, while one slice seems intact. Type of *H. Suzukianus,* "Japan, Komaba, *F. Suzuki 45,* April, 1900," is in Botanisches Museum at Berlin-Dahlem.

Fructifications spherical to obovate, about 1 cm. in diameter, white, unchanging, smoke-gray in alcohol, drying Brussels brown; sterile base slight; peridium 200–320 μ thick when fresh, composed of large, thin-walled, hyaline hyphae 7–8 μ in diameter, drying to about 35–40 μ thick (in the type); gleba white, becoming smoke-gray, cavities more or less spherical, radiating from the base; septa 70–100 μ thick, with trama proper about 22–35 μ thick, of large thin-walled compact prosenchyma, the cells of which are 3–5 μ in diameter, with a pseudoparenchymatous subhymenium; basidia 30–35 × 5–7 μ, cylindrical, sterigmata long; spores ovoid- to ellipsoid-citriform, coarsely verrucose (6–8 warts to a spore length), apiculate, pedicellate, 11–18 × 8.5–11 μ, rufous-brown.

In sandy or gravelly soil in woods. Cosmopolitan in the northern hemisphere. September to November.

The type of *H. pusillus* is very young material which may account for the small size of the fructifications. For this reason the septa are very broad and the peridium is thick, but new cavities are being formed in the fundamental tissue of its inner portion which doubtless should be considered as glebal tissue.

U. S. S. R. [RUSSIA]: Moskva, Mikhailovskoe, *N. Mossolov*, Aug. 5, 1906 (sub. *H. verrucosa* β, Bucholtz Herb. at Farlow).

FINLAND: Mustiala, *P. A. Karsten* (2 coll.).

GERMANY: Bayern, München, Englische Garten, *E. Soehner 205*, May 20, 1923 (Soehner); Hessen, Caldernesstrasse near Marburg, *R. Hesse*, 1901, Saxe Weimar, Eisenach, *R. Hesse*, 1899 (both Hesse).

FRANCE: Seine, Bois de Boulogne, *Tulasne*, 1845 (Paris); Jura?, *L. Quélet* (sub *H. pusillus*, Upsala).

ENGLAND: Portbury, *G. H. K. Thwaites*, 1845 (Hooker Herb. at Kew); Rushton, *M. J. Berkeley* (type of *H. pusillus*, Kew); Bristol, *C. E. Broome* (sub *H. decorus*, N. Y. Bot. Gard.).

MAINE: York County, Kittery Point, Cutts Island, *R. Thaxter*, Aug. 9, 1921, Sept. 10, 1903, Sept. 15, 1902, Apr. 18, 1903 (immature) (all Farlow).

JAPAN: Komaba, *F. Suzuki 45* (Berlin).

NEW YORK: Onondaga County, Jamesville, *A. H. Povah 909* (Farlow).

CALIFORNIA: Alameda County, San Francisco, *N. L. Gardner 88* (Univ. Cal. and Zeller); Santa Cruz County, Felton, *H. E. Parks 502, 512* (Univ. Cal. and Zeller).

49. HYMENOGASTER ZEYLANICUS Petch, Ann. Roy. Bot. Gard. Peradeniya **6**: 207–208. 1917; Trotter in Sacc. Syll. Fung. **23**: 599–600. 1925.

Type: in Herb. Roy. Bot. Gard. Peradeniya, a portion in Dodge Herb. and Zeller Herb.

Fructifications subglobose or depressed, up to 2 cm. in diameter, drying to 1.2 cm., brownish-yellow, drying pinkish-cinnamon or darker, sterile base absent; peridium thin, 25–40 μ thick when dry, composed of loosely woven, large, thin-walled hyphae 3–4 μ in diameter; gleba Argus brown when dry, cavities small, irregularly polygonal in the center, tending to rectangular and elongate toward the periphery, empty; septa 10–15 μ thick, compact, composed of highly gelified hyphae; basidia not seen; spores yellow-brown, ovoid-citriform, sometimes with a very slight apiculus, sometimes pedicellate, mostly acutely rounded above, exospore very slightly verrucose and covered with a closely applied utricle which appears somewhat beaded or alveolate, especially be-

low, utricle sloughing above and below, causing considerable roughening below, 13–15 × 8–10 μ.

Hypogeous. Ceylon. March to May.

CEYLON: Peradeniya, *O. Beccari*, May 10, 1885 (Brit. Mus.); Hakgala, *T. Petch 4603* type, *5478, 5479, 6437* (Peradeniya and Kew).

50. HYMENOGASTER CEREUS Hesse, Hypog. Deutschl. **1**: 128. 1891; Sacc. Syll. Fung. **11**: 171. 1895.

Illustrations: Hesse, Hypog. Deutschl. **1**: *pl. 7, f. 39.*

Type: location unknown to us.

Fructifications the size of a pea or bean, spherical, occasionally subovoid, white, becoming dull yellow; peridium unusually thin, dry, without fibrils, yellowish, composed of richly septate hyphae; gleba wax-like or fleshy, white, dull, cavities long, easily visible; basidia short, slender, 2-spored, not projecting beyond the septate paraphyses; spores broad-ellipsoid, rounded at the apex, without papilla, with a short, broad appendiculus, 16–19 × 6–10 μ, yellowish-brown, exospore wrinkled.

Under the leaf cover in forest of *Quercus* and *Fagus*. Hessen-Nassau, Germany. August and September.

51. HYMENOGASTER LUTEUS Vittadini, Monogr. Tuberac. 22. 1831; Tulasne, Fung. Hypog. 65. 1851; Quélet, Mém. Soc. d'Émulation de Montbéliard —: 377. 1873 [often cited as Champ. du Jura et des Vosges **2**: 369. 1873]; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 875. 1883; DeToni in Sacc. Syll. Fung. **7**: 171. 1888; Massee, Ann. Bot. **4**: 43. 1889 [often cited as Monogr. Brit. Gast. 43. 1889]; Hesse, Hypog. Deutschl. **1**: 130–131. 1891; Soehner, Zeitschr. f. Pilzk. **2**: 157. 1923.

Splanchnomyces luteus Corda, Icones Fung. **6**: 40. 1854.

Splanchnomyces Berkeleyanus Corda, Icones Fung. **6**: 43. 1854.

Illustrations: Vittadini, Monogr. Tuberac. *pl. 3, f. 9;* Tulasne, Ann. Sci. Nat. Bot. II. **19**: *pl. 17, f. 11–13;* Fung. Hypog. *pl. 1, f. 3;* Corda, Icones Fung. **6**: *pl. 8, f. 76, 85;* Massee, Ann. Bot. **4**: *pl. 1, f. 18;* Quélet, Mém. Soc. d'Émulation de

Montbéliard [often cited as Champ. du Jura et des Vosges **2**: *pl. 4, f. 1*].

Type: location unknown to us, although material so determined by Vittadini in Kew, Paris, and Upsala.

Fructifications depressed-globose, 1–2 cm. in diameter, drying 1.0–1.2 cm., snow-white, becoming yellow, drying bay, soft, cottony, fibrils not evident, sterile base narrowly conical; peridium 40–45 μ thick, composed of slender, thick-walled, hyaline hyphae with many white, diamond-shaped crystal inclusions; gleba yellow, drying Sudan brown, cavities small, filled with spores; septa thin, 11–18 μ thick, composed of very slender, closely interwoven hyphae, with crystal inclusions, scissile at the angles; basidia not seen; spores smooth, ovoid-fusiform, tapering to a short point, often not symmetrical, 18–22 (–28) × 9–11 μ.

Hypogeous in forest duff. Europe. September to January.

U. S. S. R. [RUSSIA: Ukraine], near Kharkov, *B. M. Czernaiev* (as *H. Klotzschii*, det. Berkeley, Upsala).

GERMANY: Bayern, Planegg bei München, *E. Soehner 688* (Soehner).

ITALY: Lombardia, Milano, *C. Vittadini* (Kew, Paris, and Upsala); *Mattirolo 9* (Lloyd Mus.).

FRANCE: Vaucluse, *L. Quélet* (Upsala).

ENGLAND: Norfolk, King's Lynn, *C. B. Plowright* (Berlin); Wiltshire, *C. E. Broome* (Brown Univ.).

51a. var. SUBFUSCUS Soehner, Krypt. Forsch. **1**: 394–395. 1924.

This variety differs in that the surface of the fructification is never pure white, but dirty white with gray tones; gleba not sulphur-yellow but gray-white tending toward brownish and becoming Vandyke brown in age.

Martinsried, Planegg, Germany. Rare.

52. HYMENOGASTER LEVISPORUS Massee & Rodway in Rodway, Papers & Proc. Roy. Soc. Tasmania **1911**: 30. 1912.

Type: in Kew.

Fructifications irregularly spherical, 1.5–2.5 cm. in diameter, white; peridium very thin, 45–75 μ thick, subfloccose, stupose, continuous with the surrounding mycelium; large hemispher-

ical base drying warm buff, with radius of 3 mm. becoming obsolete; gleba rather dense, pale brown, drying Argus brown, cavities small; septa hyaline, 37–45 μ thick, of interwoven hyphae; spores pale brown, obovoid-ellipsoid to subspherical, smooth but very slightly roughened on the distal end, slightly pedicellate, 8–9 × 5.5–6 μ.

South Australia and Tasmania. May.

SOUTH AUSTRALIA: Encounter Bay, *J. B. Cleland 20* (Dodge and Zeller).
TASMANIA: *L. Rodway 653*, type (Kew).

53. HYMENOGASTER **Remyi** Zeller & Dodge, sp. nov.

Fructificationes subspericae, reniformes, depressae, 2.5 × 1.5 cm. siccatae, albidae vel isabellinae, laeves vel innato-fibrillosae, basis sterilis non visa; peridium laxe stuposum, hyphis contextis, 60–75 μ crassitudine, hyalinum; gleba "Argus brown" vel "Brussels brown," cavitatibus mediocribus; septa stuposa, 30–35 μ crassitudine, hyalina, gelificata; basidia clavata, tetraspora; sporae obovoideae vel ellipsoideae, inferne attenuatae, brunneae, minute verrucosae, 8–11 × 5.5–7.5 μ.

Type: in Patouillard Herb. at the Farlow Herbarium of Harvard University.

Fructifications subspherical, reniform or depressed, 2.5 × 1.5 cm. when dry, whitish or isabelline when dry, no sterile base; peridium loosely stupose, of interwoven hyphae, 60–75 μ thick, hyaline; gleba Argus brown to Brussels brown, with medium cavities; septa stupose, 30–35 μ thick, hyaline, somewhat gelified; basidia clavate, 4-spored; spores obovoid or ellipsoid, attenuated below, brown, minutely verrucose with distal end quite warted, 8–11 × 5.5–7.5 μ.

The young spores have an extremely attenuated base. This species differs from the other species of the *H. albus* group in the attenuated obovoid spores.

FRANCE: Hautes Alpes, Briançon, *M. Remy*, type (Farlow).

54. HYMENOGASTER MAIDENI Rodway, Papers & Proc. Roy. Soc. Tasmania **1920**: 157. 1921; **1923**: 152. 1924; Trotter in Sacc. Syll. Fung. **24**: 1327–1328. 1928.

Type: in Rodway Herb. but not seen by us.

Fructifications globose, 2 cm. in diameter; peridium very thin, white or slightly ochraceous when exposed; sterile base

obsolete; gleba white, becoming pale ochre when dry, tough, canals numerous, small, contorted; spores ovoid to oblong, yellow-brown, smooth, 10–12 × 6 μ, one or both ends subacute.

McRobie's Gully, Tasmania.

Rare. Differing from *H. albellus* in paler gleba and spores. —Rodway.

DOUBTFUL SPECIES

1. HYMENOGASTER AROMATICUS Velenovsky, Česky Houby, 800. 1922.

Fructifications the size of a walnut, rounded, but with rhizomorphous stipe at base with coarse grooves without any fibrils, at first pure white, smooth, then dirty yellowish, quite strong, hard, and only somewhat peeling; gleba elastic, like a mushroom, composed of quite large, yellowish-brown chambers with light walls; spores copper-yellow, ovoid-ellipsoid, with truncate narrowed base, rough, 12–14 μ long, apex 2 μ long.

In dark humus in woods of young pine, deep under the surface, on warm southern slopes at Jilovist, first of May, 1915. This species has a very agreeable, strong odor of fruit. It is related to *H. muticus, H. luteus,* etc., but is distinguished by its small spores.

2. HYMENOGASTER AUREUS Rodway, Papers & Proc. Roy. Soc. Tasmania **1923**: 152–153. 1924.

Type: in Rodway Herb. but not seen by us.

Irregularly subglobose, mostly 1–2 cm. in diameter, bright golden-yellow, surface rugose; peridium tough, yellow, about 0.5 mm. thick; gleba compact, pale brown, canals small, numerous, contorted; spores ellipsoid-fusiform, quite smooth, allantoid, pale yellow, 15–21 × 6 μ.

Mt. Wellington, 3,000 feet.

Differs from *H. albellus* in color, thickness of peridium, and glabrous allantoid spores.

3. HYMENOGASTER FLAVIDUS Bonorden, Hedwigia **15**: 49–50. 1876: DeToni in Sacc. Syll. Fung. **7**: 491. 1888.

Type: location unknown to us.

Fructifications various, mostly globose, bright yellow when young with rose-colored and white spots on the base (at least when exposed to the air), becoming dark yellow on ripening; peridium thin, papery, composed of branching, anastomosing, septate hyphae; gleba white, horn-like, cavities irregular; septa composed of short, articulated, inflated hyphae [pseudoparenchyma?]; basidia ovoid; spores sessile, oblong, hyaline.

Schwetzinger forest, near Heidelberg, Germany.

There is little in the above description to suggest *Hymenogaster,* but we prefer to wait until further study before transferring it (cf. *Hysterangium Petri* or *H. Rickeni* var. *pinetorum*).

4. Hymenogaster rufus Vittadini, Monogr. Tuberac. 23. 1831; Tulasne, Fung. Hypog. 64. 1851; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 874. 1883; DeToni in Sacc. Syll. Fung. **7**: 174. 1888.

Illustrations: Vittadini, Monogr. Tuberac. *pl. 3, f. 17.*

Fructifications subglobose, the size of a filbert; peridium whitish, rufescent, sub-silky, thin, subtomentose, with a minute sterile base; gleba reddish, fuscous, cavities a little larger and irregular; septa whitish, homogeneous; spores obovoid, subsessile, rufous; odor weak.

With *Hymenogaster Bulliardi.* Transpadane Province, Italy. Winter.

Similar in appearance to a fructification of *Gautieria morchelliformis.* Easily mistaken for *Hymenogaster lycoperdineus,* from which it may be distinguished by the color of the gleba, odor and shape of the spores.

5. Hymenogaster Setchellii Harkness, Proc. Cal. Acad. Sci. Bot. III. **1**: 246. 1899; Sacc. & Sydow in Sacc. Syll. Fung. **16**: 254. 1902.

Type: location unknown to us, not among the cotypes in Dudley Herb. at Stanford Univ.

Minute, 1.5 cm. in diameter, white, turning to brown, subglobose, smooth; gleba buff, elastic; cells large, sinuous; sterigmata elongated; spores citriform, guttulate, $7 \times 9\ \mu$.

Under *Vaccinium*, beneath vegetable humus. Mt. Tamalpais, Marin County, California. April.

Excluded Species

1. Hymenogaster fulvus Rodway, Papers & Proc. Roy. Soc. Tasmania **1917**: 109. 1918; **1919**: 112. 1920; Lloyd, Myc. Notes 65: 1088. 1921; Trotter in Sacc. Syll. Fung. **24**: 1327. 1928, is *Rhizopogon rubescens* Tulasne.

2. Hymenogaster microsporus Berkeley, Jour. Linn. Soc. [London] Bot. **9**: 423. 1867; DeToni in Sacc. Syll. Fung. **7**: 171. 1888, is **Lycoperdon microsporus** (Berkeley) Zeller & Dodge, comb. nov.

3. Hymenogaster Pumilionum Ade, Mitt. Bayer. Bot. Ges. **2**: 219. 1909; Sacc. & Trotter in Sacc. Syll. Fung. **21**: 496. 1912, is *Rhizopogon Pumilionum* Bataille, Bull. Soc. Myc. France **39**: 170. 1923, or *Rhizopogon rubescens* Soehner, Krypt. Forsch. **1**: 393. 1924. Soehner studied the type, which seemed to him to be an alpine form of the latter species.

4. Hysterangium **Moselei** (Berk. & Br.) Zeller & Dodge, comb. nov.

Hymenangium Moselei Berkeley & Broome, Jour. Linn. Soc. [London] Bot. **16**: 40. 1877.

Hymenogaster Moselei DeToni in Sacc. Syll. Fung. **7**: 172. 1888.

Type: in Broome Herb. at Brit. Mus. and in Berk. Herb. at Kew.

Fructifications about 1.2 cm. in diameter, subspherical, attenuate at the base, citrine-yellow, smooth, becoming wrinkled on drying; peridium variable in thickness, up to 320 μ thick, of loosely woven subparallel gelified hyphae 8–9 μ in diameter, columella inconspicuous, branching near the white base; gleba ochraceous, drying raw sienna to antique brown; septa 14–20 μ thick, of very slender parallel, gelified hyphae; basidia pyriform, 7–9 × 5–6 μ, sterigmata short; spores smooth, ellipsoid, light yellow, about 10–11 × 4–5 μ.

NEW SOUTH WALES: Pennant Hills near Parramatta, *Challenger Exp.*, type (Brit. Mus. and Kew).

RICHONIELLA

Richoniella Costantin & Dufour, Fl. Champ. 203; Bataille, Bull. Soc. Myc. France **39**: 179. 1923.

Nigropogon Coker & Couch, Gasteromycetes Eastern U. S. & Canada, 37–38. 1928.

The type species is *Hymenogaster leptoniisporus* Richon. The type species of *Nigropogon* is *N. asterosporus* Coker & Couch.

Fructifications subglobose to irregular; fibrils lacking or merely rudimentary below; peridium prosenchymatous, entirely enclosing a gleba; gleba white, becoming colored like the spores, cavities sinuous, empty or nearly filled with spores; septa prosenchymatous, continuous with the peridium; basidia 2–4-spored; spores angular as in *Leptonia*, russet or rosy.

KEY TO SPECIES OF RICHONIELLA

Spores 12–15 μ long, angles of spores acute-rounded....*R. asterospora* (p. 683).
Spores 8–11 μ long, angles of spores obtuse-rounded....*R. leptoniispora* (p. 684).

1. RICHONIELLA **asterospora** (Coker & Couch) Zeller & Dodge, comb. nov.

Nigropogon asterosporus Coker & Couch, Gasteromycetes Eastern U. S. & Canada 37–38. 1928.

Illustrations: Coker & Couch, Gasteromycetes Eastern U. S. & Canada, *pl. 108, f. 3–7.*

Type: in Univ. N. Car. Herb.

Fructifications hypogeous, 1 cm. thick, drying about ½ the diameter, subglobose, surface smooth, nearly pure white, drying tawny or Sanford's brown, attached by fibrils at the base; peridium 100–220 μ thick, drying 18–37 μ thick, of hyaline, homogeneous prosenchyma; gleba pure white, becoming pale vinaceous-russet or pecan-brown, drying Sayal brown, cavities sinuous, empty; septa 80–100 μ thick, drying 20–30 μ, of hyaline, compact prosenchyma, continuous with the peridium; basidia 7.5–9 μ thick below, 5.5–6.5 μ thick above, 26–38 μ long, 4-spored (rarely 2-), distal half collapsing after spore maturity;

spores nearly sessile, pale russet *en masse,* angular as in *Leptonia,* angles acute, usually 4-angled in optical section, attenuated below, 12–15 × 8–11.5 μ. "Odor when fresh slightly like an old Irish potato but not unpleasant; on drying becoming like that of ham, faintly nitrous or phosphorous."

Slightly buried in soil under deep layer of decayed leaves of *Quercus* and *Cornus.* North Carolina. October.

NORTH CAROLINA: Orange County, Chapel Hill, *J. N. & Else B. Couch,* type (Univ. N. Car. 8271).

2. RICHONIELLA LEPTONIISPORA (Richon) Costantin & Dufour, Fl. Champ. 203; Bataille, Bull. Soc. Myc. France **39**: 179. 1923.

Hymenogaster leptoniisporus Richon, Bull. Soc. Bot. France **34**: 59–60. 1887; Catal. Champ. Marne, 518. 1889; DeToni in Sacc. Syll. Fung. **7**: 172–173. 1888; Sacc. & Fautrey, Bull. Soc. Myc. France **16**: 25. 1900.

Illustrations: Richon, Bull. Soc. Bot. France **34**: *pl. 2, f. 1;* Catal. Champ. Marne, 518; Costantin & Dufour, Fl. Champ. *pl. 68, f. 25;* Sacc. & Fautrey, Bull. Soc. Myc. France **16**: *pl. 2, f. 1.*

Type: France, Marne, Luzernières, *C. Richon,* not seen by us.

Fructifications 5–6 cm. high, 1.5–4.5 cm. in diameter, fleshy but firm, spherical to pyriform or irregularly lobed, white at first, then ochraceous, smooth, depressed below and usually without fibrils but rarely with a fascicle of brown fibrils below; peridium 18–30 μ thick, of hyaline prosenchyma with a darker surface with soil inclusions; gleba white at first, then rufescent, cavities irregular; septa 20–30 μ thick, of hyaline prosenchyma; sterigmata short, basidia crowded, obovoid, 2–4-spored; spores angular as in *Leptonia,* angles obtuse-rounded, smooth, at first hyaline then pink or rosy, guttulate, 8–11 × 7–9 μ. Odor none.

Solitary or gregarious; hypogeous, in cultivated fields or grassy locations. France. August to October.

FRANCE: Meuse, Verdun, *M. Pancau* (Paris and Patouillard ex Herb. Boudier).

DENDROGASTER

Dendrogaster Bucholtz, Hedwigia **40**: 316–318. 1901; Материалы къ морфологіи и систематикѣ подземныхъ грибовъ . . .

Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ с. Михайловскомъ Московской Губ. 1: 148–151. 1902 [often cited as Beitr. Morph. Syst. Hypog.]; Sacc. & D. Sacc. in Sacc. Syll. Fung. 17: 240–241. 1905.

The type species of the genus is *Dendrogaster connectens* Bucholtz.

Fructifications spherical to reniform; columella dendroid, sometimes prolonged into a short stipe-like rooting base; peridium varying from simple to duplex and from slender hyphae to pseudoparenchyma, always well developed; gleba usually some shade of brown; septa of slender hyphae; basidia mostly 4–2-spored; spores ellipsoid to fusiform, occasionally obovoid, sculptured as in *Hymenogaster*, but with a conspicuous utricle, or nearly smooth in other species.

This genus is intermediate between species of *Gautieria* with a well-developed peridium and *Hymenogaster*. It differs from *Gautieria* in the conspicuous utricle, and from *Hymenogaster* in the well-developed columella, the utricle being more conspicuous than in most species of *Hymenogaster* as well.

While the genus is widespread, the individuals are rather rare and the species are known only from a very limited area, several only from the type collection.

Key to Species of Dendrogaster

1. Spores covered by a loose, saccate utricle 3
1. Spores not covered by a loose, saccate utricle 2
   2. Spores 14–18 × 9.5–12 μ, obovoid-ellipsoid, brown .....*D. major* (p. 686)
   2. Spores 20–25 × 11–16.5 μ, obovoid to subcitriform; peridium glabrous, thin .....*D. megasporus* (p. 686)
   2. Spores 9–12 × 6–7 μ, ovoid; peridium villose with tufts of erect hyphae .....*D. cambodgensis* (p. 687)
   2. Spores 10–13.5 × 7–9 μ, ellipsoid, minutely striate-verrucose; peridium flaking off, leaving patches ..... *D. candidus* (p. 688)
   2. Spores 12.5–15 × 8–10 μ, ellipsoid, broadly truncate below, minutely verrucose on sides, coarsely so above, covered by a utricle, pinkish .....*D. radiatus* (p. 688)
3. Spores large, smooth, 20 × 10.7 μ .....*D. connectens* (p. 689)
3. Spores about half as long as above 4
   4. Peridium 220 μ or more thick; septa 70–80 μ thick; spores smooth, with conspicuous utricle, 10–13.5 × 6–7.5 μ .....*D. utriculatus* (p. 689)
   4. Peridium thinner, less than 175 μ thick; septa less than 60 μ thick 5

5. Peridium 80–140 μ thick; spores slightly verrucose, 8–11 × 5–6 μ.....
.....*D. globosus* (p. 690)
5. Peridium 100–175 μ thick; spores smooth, 10.5–11 × 6–7 μ...*D. foetidus* (p. 691)

1. **Dendrogaster major** Zeller & Dodge, sp. nov.

Fructificationes oblate spheroideae, 2–3.5 cm. diametro, 1.5–2 cm. altitudine metientes, colore (recentium) ignota, superficie laevi, sericea; basis sterilis prominens, pulvinata (immatura); columella ramosa, crassa, percurrens, ramis tenuibus, planatis; peridium 240–300 μ crassitudine servatum, hyphis tenuissimis contextum; gleba brunnea, loculis ab columella radiantibus; septa 140–160 μ crassitudine, hyphis hyalinis tenuibus contexta; basidia 16–18 × 6–7 μ, hyalina, tetraspora; sporae obovoideo-ellipsoideae, brunneae, guttulatae, episporio verrucoso, 14–18 × 9.5–12 μ,

Type: in Dudley Herb. at Stanford, Zeller Herb., and Dodge Herb.

Fructifications oblate-spheroidal, 2–3.5 cm. in diameter, 1.5–2 cm. high, becoming muddy color in preservative, surface smooth, silky; sterile base prominent, pulvinate (in young specimens), leading upward into a stout branched, percurrent columella with thin, flattened branches; peridium 240–300 μ thick (in preservative), of very slender, hyaline, interwoven hyphae; gleba brown, cavities radiating from the columella and its branches; septa 140–160 μ thick, of very slender, hyaline, interwoven hyphae; basidia 16–18 × 6–7 μ, hyaline, 4-spored; spores obovoid-ellipsoid, brown, guttulate, epispore verrucose, 14–18 × 9.5–12 μ.

Under *Quercus agrifolia*. San Mateo County, California. March.

The type material of *Dendrogaster major* is in a preservative and overgrown by a Phycomycete, the large hyphae of which have penetrated the peridium and portions of the septa of the large fructification.

CALIFORNIA: San Mateo County, Palo Alto, on Jasper Ridge near Stanford University, *James McMurphy 281*, type (Stanford, Zeller, and Dodge).

2. DENDROGASTER **megasporus** Zeller & Dodge, sp. nov.

Fructificationes 1–2 cm. diametro metientes, griseae vel sordide brunnescentes; columella parce ramosa; peridium 250–350 μ crassitudine, laxe fibrosum recens, 35–85 μ siccatum, prosenchymaticum vel stuposum; gleba "pale tan" vel lutescens brunnescensque, "cinnamon-brown" vel "mummy-brown" siccata, locellis magnis;

septa 30–35 μ crassitudine, stuposa; basidia 1–2-spora, hyalina, clavata vel cylindrica, 20–25 × 7–8 μ; sporae obscure brunneae, obovoideae vel subcitriformes, 20–25 × 11–16.5 μ; episporio leviter rugosa.

Type: in Univ. Cal. Herb.

Fructifications 1–2 cm. in diameter, from a scant mycelium, becoming gray or dirty brown at maturity; columella slightly branched, extending from one-half to two-thirds of the distance through the gleba; peridium 250–350 μ thick, loosely fibrous when fresh, drying 35–85 μ, closely stupose to almost prosenchymatous; gleba pale tan or yellowish, becoming brown, drying cinnamon-brown to mummy-brown, cavities large, shrinking greatly on drying; septa 30–35 μ thick, stupose; basidia 1–2-spored, hyaline, clavate to cylindrical, 7–8 × 20–25 μ; spores dark brown, obovoid to slightly citriform, 20–25 × 11–16.5 μ, epispore slightly wrinkled.

In soil under *Quercus* and *Laurus*. California. January.

California: Santa Clara County, Saratoga, *H. E. Parks 967, 977* type (Univ. Cal.).

3. Dendrogaster cambodgensis Patouillard, Bull. Soc. Myc. France **39**: 55–56. 1923.

Illustrations: Patouillard, Bull. Soc. Myc. France **39**: 56. *f. 1.*

Type: in Patouillard Herb. at Farlow Herb.

Fructifications subglobose to ovoid, citrine-yellow or ochraceous, 1–3 cm. in diameter, rounded above, depressed and concave below, with a slight tubercle-like sterile base in the center of the depression; sterile base yellow, firm, small; peridium thin, minutely furfuraceous, caused by simple groups of cylindrical, yellow hyphae, 25–60 × 4–6 μ; columella arising from the sterile base, irregular, more or less branched, grayish, somewhat gelatinous; gleba chocolate-color, cavities 100–250 ×100 μ, radiating from the columella to the periphery, separated by narrow septa; basidia mostly 2-spored, 18–25 μ long; spores ochraceous-brownish, ovoid, attenuate in a short beak toward the summit, rounded at the base, 9–12 × 6–7 μ, very finely verrucose and surrounded by a very closely fitting utricle which

often becomes ragged at maturity, with a large oil globule, often appendiculate.

Cambodia.

The citrine color of the fungus is due to a resinous matter which dissolves in alcohol; and the surface becomes brown.

CAMBODIA: Kompong Chnang, *M. Petelot*, type (Patouillard Herb. at Farlow).

4. DENDROGASTER **candidus** (Harkness) Zeller & Dodge, comb. nov.

Hymenogaster candidus Harkness, Proc. Cal. Acad. Sci. Bot. III. 1: 247. 1899; Sacc. & Sydow in Sacc. Syll. Fung. 16: 253. 1902.

Type: cotype in Dudley Herb. at Stanford.

Fructifications not over 2 cm. in diameter, white, becoming ferruginous in alcohol; sterile base prominent, columella very reduced; peridium flaking off, leaving only a few patches, the portion left being pseudoparenchymatous, thin; gleba ferruginous, cavities comparatively large, empty; septa 250–275 μ thick, composed of compactly interwoven branched hyphae; paraphyses clavate, 25–30 × 4–6 μ; basidia clavate, 45–60 × 7–8 μ, projecting beyond the paraphyses, sterigmata 4–5 μ long; spores ellipsoid, minutely striate-verrucose, with a closely applied utricle, 10–13.5 × 7–9 μ, 1-guttulate.

Under *Pseudotsuga*. California. May.

CALIFORNIA: Placer County, Towle, *H. W. Harkness 49*, cotype (Stanford).

5. DENDROGASTER **radiatus** (Lloyd) Zeller & Dodge, comb. nov.

Hymenogaster radiatus Lloyd, Myc. Notes 73: 1304. 1925; Verwoerd, S. Afr. Jour. Sci. 22: 166. 1925.

Illustrations: Lloyd, Myc. Notes 73: *f. 2908–2909*.

Type: in Lloyd Museum and in Union of South Africa, Dept. Agr. Myc. Herb.

Fructifications 1–2.5 cm. in diameter, subglobose, rubbery-tough, surface smooth, dirty white, drying rugulose, chamois to fawn-color; peridium simple, of homogeneous hyaline pseudoparenchyma of large vesiculose cells, tough, easily separable and distinct from the gleba, 185–260 μ thick; gleba gelified, rub-

bery, drying avellaneous to wood-brown, hard, flinty, opalescent because of the gelified septa which radiate from the head (?) of a capitate columella; septa opalescent, of very fine interwoven hyphae immersed in a gel, distinct from the peridium, 35–100 μ thick; basidia not seen; spores sessile, broadly ellipsoid, broadly truncate below, finely verrucose (coarsely above), covered by a gelified sheath (utricle?), 12.5–15 × 8–10 μ, pinkish.

Hypogeous in leaf-mould at foot of trees. Rhodesia, South Africa. March.

Union of South Africa: S. Rhodesia, Salisbury, *F. Eyles 2530*, type (Lloyd Mus. 30493, and Union of S. Africa, Dept. Agr. Myc. Herb. 17795).

6. Dendrogaster connectens Bucholtz, Hedwigia **40**: 316–318. 1901; Материалы къ морфологіи и систематикѣ подземныхъ грибовъ ... Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ С. Михайловскомъ Московской губ. 1: 148-151. 1902 [often cited as Beitr. Morph. Syst. Hypog.]; Sacc. & D. Sacc. in Sacc. Syll. Fung. **17**: 241. 1905.

Illustrations: Bucholtz, *l. c. pl. 3, f. 15–16.*

Type: portion in Patouillard Herb. at Farlow Herb., and in Berlin.

Fructifications globose, the size of a filbert, rufous; peridium thin, composed of loosely stretched and woven hyphae, more closely woven next the gleba; sterile base present, columella branching, dendroid; gleba light ochraceous-brown; septa composed of slender hyphae sometimes more highly refractive and irregular in the middle; basidia 2-spored, not projecting much beyond the paraphyses, long sterigmata; spores brownish-rufous, oblong-ellipsoid, smooth, with irregular, wrinkled, saccate utricle, short-appendiculate, short-apiculate, 20 × 10.7 μ.

Mikhailovskoe, near Moscow, Russia. August.

The young spores of this species are very similar in shape and markings to those of *Hymenogaster olivaceus.*

U. S. S. R. [Russia]: Moskva, Mikhailovskoe, *F. Bucholtz*, Aug. 14, 1899, type (Farlow and Berlin).

7. Dendrogaster **utriculatus** (Harkness) Zeller & Dodge, comb. nov.

Hymenogaster utriculatus Harkness, Proc. Cal. Acad. Sci. Bot. III. 1: 246. 1899; Sacc. & Sydow in Sacc. Syll. Fung. 16: 254. 1902.

Illustrations: Harkness, Proc. Cal. Acad. Sci. Bot. III. 1: *pl. 42, f. 6a–6f;* Rev. Myc. 22: *pl. 204, f. 1–5.*

Type: cotype in Dudley Herb. at Stanford.

Fructifications large, irregular, white when fresh, becoming chocolate-brown, enveloped in white mycelium, sterile base slight; columella dendroid, reaching the middle of the fructification; peridium 220–240 μ thick, the outer portion brownish, shading to white within, composed of gelified, parallel hyphae; gleba marbled brown and white when fresh, becoming chocolate-brown, cavities partially filled with spores radiating from the columella; septa 70–80 μ thick between hymenial layers, composed of gelified hyphae; basidia broadly clavate, 25–30 × 7–8 μ, sterigmata 3 μ long; spores ellipsoid to obovoid, smooth, lemon-yellow, enclosed in a utricle which shrinks, appearing alveolate at times, but very irregular, 10–13.5 × 6–7.5 μ (without utricle).

Under *Sequoia, Quercus,* and *Eucalyptus.* California. December to February.

Part of *Harkness 244* is *Hydnangium* sp.

CALIFORNIA: Alameda County, Berkeley, *N. L. Gardner 68, 230* (Univ. Cal. and Zeller); Marin County, Mill Valley, *H. W. Harkness 244* in part, cotype (Stanford); Muir Woods, *H. E. Parks 1165, C. W. Dodge* (Univ. Cal., Dodge, and Zeller); Santa Clara County, Aldercroft Creek, near Los Gatos, *H. E. Parks 1162, 1163, C. W. Dodge 2126* (Dodge and Zeller); Saratoga, *H. E. Parks 1128* (Univ. Cal.).

8. DENDROGASTER **globosus** (Harkness) Zeller & Dodge, comb. nov.

Hymenogaster globosus Harkness, Proc. Cal. Acad. Sci. Bot. III. 1: 246. 1899; Sacc. & Sydow in Sacc. Syll. Fung. 16: 255. 1902.

Type: cotype in Dudley Herb. at Stanford.

Fructifications small, globose, 0.6–0.9 cm. in diameter, dirty white, becoming brownish; sterile base broadly conical; columella erect, stout to the center of the fructification, branches radiating in all directions from head of columella; peridium

variable, 80–140 μ thick, composed of pseudoparenchyma of hyaline cells up to 10 μ in diameter; gleba fuscous to cinnamon, cavities filled with spores; septa composed of medium-sized gelified hyphae, 20–40 μ between hymenial layers; basidia so gelified in type that structure not certain; spores ellipsoid, finely verrucose, surrounded by a loose utricle, 8–11 × 5–6 μ without utricle, light brown.

In damp ground. California. July.

Harkness 245 without locality, determined as this species, has the outer portion of the peridium brown, the inner portion nearly hyaline; basidia linear to narrowly clavate, inconspicuous, with rather large sterigmata.

California: *H. W. Harkness 245;* Marin County, Mill Valley, *H. W. Harkness 246*, cotype (both Stanford).

9. Dendrogaster **foetidus** (Coker & Couch) Zeller & Dodge, comb. nov.

Hymenogaster foetidus Coker & Couch, Gasteromycetes Eastern U. S. & Canada, 45–47. 1928.

Illustrations: Coker & Couch, Gasteromycetes Eastern U. S. & Canada, *pl. 17, 18, 110.*

Type: in Univ. N. Car. Herb.

Fructifications 0.7 cm. in diameter or less, spherical, white at first, becoming light ochraceous-buff on drying; radiating mycelium at base with pale ochraceous fibres, 1 cm. or more long; columella reaching the center of the fructification, ending in an irregular head, cartilaginous, at least shrinking on preservation in alcohol; peridium simple, appearing duplex by the outgrowth of mycelial threads which bind humus particles to the surface, simulating patches, true peridium 100–175 μ thick (usually 100–130 μ), composed of olivaceous-yellow, thick, rough-walled hyphae 5–7 μ in diameter; gleba brownish-olive, cavities irregular, partially filled; septa 45–60 μ thick, composed of thin-walled, slender, closely woven, hyaline hyphae; basidia pyriform, 4 spored, 7 × 25 μ, sterigmata short; spores smooth, ovoid to ellipsoid, surrounded by a gelified, saccate sheath, 10.5–11 × 6–7 μ.

Under *Abies* and *Fagus*. Tennessee and North Carolina. Summer.

NORTH CAROLINA: Old Hillsboro Road, 4 miles from Chapel Hill, *J. N. Couch*, type (Univ. N. Car. 7467).
TENNESSEE: Burbank, *R. Thaxter B1H* (Farlow).

GAUTIERIA

Gautieria Vittadini, Monogr. Tuberac. 25–27. 1831; Tulasne, Fung. Hypog. 62–63. 1851; Zobel in Corda, Icones Fung. **6**: 33–34. 1854; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 873–874. 1883; DeToni in Sacc. Syll. Fung. **7**: 177–179. 1888; Hesse, Hypog. Deutschl. **1**: 105–110. 1891.

Gautiera Endlicher, Gen. Pl. 30. 1836; Corda, Anleit. z. Stud. Myc. 114. 1842; Icones Fung. **5**: 28. 1842; Rabenhorst, Deutschl. Krypt.-Fl. **1**: 252. 1844; Fries, Summa Veg. Scand. 435. 1849.—*not Gautiera* Rafinesque, Med. Fl. **1**: 202. 1828.

Chamonixia Rolland, Soc. Myc. France Bull. **15**: 76. 1899.

The type species of the genus is *Gautieria morchelliformis* Vittadini.

Fructifications spherical to somewhat irregular or flattened, with a simple or branched rhizomorph sometimes persisting as a short stipe; columella variable in size and shape, often branching at the base; peridium thin, fugacious or persistent, in some species scarcely more than sterile outer septa but well differentiated in others; gleba white at first, becoming colored by the masses of spores, cavities variable in size, often elongated, labyrinthiform; septa homogeneous, composed of closely interwoven hyphae; basidia clavate, usually 2–3-spored, with long sterigmata; spores lanceolate, fusiform, ellipsoidal (rarely citriform), with longitudinal striae usually highly developed on the epispore.

KEY TO SPECIES OF GAUTIERIA

1. Peridium early evanescent or lacking 2
1. Peridium persistent 12
2. Spores averaging 15 μ or more long 3
2. Spores averaging less than 15 μ long 9
3. Gleba slate-colored; septa about 300 μ thick, opalescent ....*G. plumbea* (p. 694)
3. Gleba some shade of brown; septa mostly less than 300 μ thick, whitish 4

4. Spores narrowly lanceolate or fusiform, 18–27 × 7–10 μ..*G. chilensis* (p. 694)
4. Spores ellipsoid, ovoid, or obovoid, diameter more than ½ the length... 5
5. Cystidia numerous and prominent..... 6
5. Cystidia not numerous and prominent, if present only in upper cavities.... 7
6. Spores obovoid, 18–19 × 11–12 μ, with 7–10 almost smooth striations.... .....*G. graveolens* (p. 695)
6. Spores ellipsoid, 16–21 × 8–10 μ, with 5–9 rather warted striations..... .....*G. gautierioides* (p. 697)
7. Stipe short or absent, spores ellipsoid to obovoid with 8 slightly warted striae, 15–18 × 9–11 μ.....*G. retirugosa* (p. 697)
7. Stipe rather well developed..... 8
8. Spores narrowly ellipsoid or obovoid, with 6–8 slightly warted and branched striae, 13–17.6 × 7–10 μ; septa 200–300 μ thick..... .....*G. caudata* (p. 698)
8. Spores broadly ellipsoid, with 8–10 rather sinuous striae, 12–24 × 8–12.5 μ; septa about 75 μ thick.....*G. morchelliformis* (p. 698)
8. Spores ellipsoid, with 8–9 striae with conical warts, 12–18 × 8–10 μ; septa 225–275 μ thick.....*G. Trabuti* (p. 700)
9. Gleba slate-colored; septa about 300 μ thick.....*G. plumbea* (p. 694)
9. Gleba brown; septa mostly less than 300 μ thick..... 10
10. Spores averaging less than 12 μ long, ellipsoid to obovoid, with 7–10 slightly warted striae; septa 120–400 μ thick.....*G. monticola* (p. 700)
10. Spores averaging more than 12 μ long..... 11
11. Spores 12–18 × 8–10 μ, ellipsoid, with 8–9 striae with conical warts; septa 225–275 μ thick.....*G. Trabuti* (p. 700)
11. Spores 11–15 × 7–8 μ, with 8–10 sinuous, rather warted striae; septa about 150 μ thick.....*G. mexicana* (p. 701)
11. Spores 12–16 × 6–8 μ, with 10 smooth striae, septa about 90–180 μ thick .....*G. graveolens* var. *Otthii* (p. 696)
12. Peridium very thin, early evanescent, cystidia prominent..... .....*G. graveolens* (p. 695)
12. Peridium thick, persistent, cystidia not prominent..... 13
13. Peridium distinctly duplex..... 14
13. Peridium distinctly simplex..... 15
14. Spores lanceolate, narrowly ellipsoid or obovoid, striae smooth, branched or anastomosing, 17–21 × 7–11 μ.....*G. Rodwayi* (p. 702)
14. Spores ovoid or ellipsoid, striae smooth, 12–14 × 7–8 μ..*G. pallida* (p. 702)
15. Spores with 4 (sometimes 5) striae as viewed from the end, 15–17 × 8–10 μ .....*G. mucosa* (p. 703)
15. Spores with 6 or more striae, as viewed from the end..... 16
16. Spores averaging less than 12 μ long.....*G. monticola* (p. 700)
16. Spores averaging more than 12 μ long..... 17
17. Spores broadly ellipsoid, 19–21 × 11–15 μ, with 6–10 slightly warted striae.. .....*G. albida* (p. 704)
17. Spores narrowly ellipsoid or obovoid, 12–20 × 7–10 μ, with 8–10 smooth striae; septa 200–300 μ thick; peridium 600 μ thick.....*G. Harknessii* (p. 704)
17. Spores ovoid-ellipsoid, 14–19 × 7–11 μ, with 9–11 smooth striae; septa 65–100 μ thick; peridium 240–420 μ thick.....*G. Parksiana* (p. 705)

1. GAUTIERIA PLUMBEA Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 138–139. 1918.

Illustrations: Ann. Mo. Bot. Gard. 5: *pl. 9, f. 4.*

Type: in Weir, Dodge, and Zeller Herbaria.

Fructifications ovoid, 4 cm. in diameter, cordate, surface convoluted, light brownish-olive to mummy-brown; stipe 2 mm. thick; columella branched, percurrent, gelified; gleba plumbeous-black, slate-color in preservative, drying fuscous-black, gelified, cavities irregular, mostly radiating from the columella, empty; septa about 300 μ thick, composed of highly gelified, hyaline hyphae; subhymenial layer pseudoparenchymatous, of large angular cells; cystidia large, 52–61 × 25–35 μ, hyaline, guttulate, obovoid, often somewhat apiculate; paraphyses narrowly clavate, hyaline, guttulate, septate, 4–5 μ in diameter, some knobbed at the tip, some filiform; basidia hyaline, clavate, 20–26 × 9–10 μ, 1–4-spored, sterigmata less than half the length of the spores; spores 11–16 × 6.5–8 μ, short-pedicellate, English red to burnt sienna, striae 7–10, wavy, young spores ovoid to ellipsoid, smooth, becoming striate.

Under conifers. British Columbia and Idaho. September to October.

BRITISH COLUMBIA: Quartz Creek above Beavermouth, *C. W. Dodge 1536* (Dodge).

IDAHO: Priest River, *J. R. Weir*, type (Weir, Zeller 1458, and Dodge 859).

2. GAUTIERIA **chilensis** Zeller & Dodge, sp. nov.

Fructificationes pyriformes, 1–2 cm. diametro metientes, obscure brunneae; columella dendroidea; peridium non visum; gleba compacta, ochracea; septa albida, 40–50 μ crassitudine, tramate prosenchymatico stratis subhymenialibus pseudoparenchymaticis; basidia clavata vel cylindrica, 2–4-spora; sporae fusiformes vel anguste obovoideae, lanceolatae immaturitate, 6–8 striis longitudinalibus subirregularibus verrucosis, 18–27 × 7–10 μ.

Type: in Farlow Herb. at Harvard University.

Fructifications pyriform, 1–2 cm. in diameter, dark brown; columella dendroid; peridium not present in specimen examined; gleba firm, dense, ochraceous; septa white, 40–50 μ thick, of a central plate of prosenchyma with pseudoparenchymatous subhymenial layers; basidia clavate to cylindrical, 2–4-spored;

spores fusiform to narrowly obovoid, young spores lanceolate, 18–27 × 7–10 μ, with 6–8 longitudinal ribs somewhat irregular and warted.

Chile. February and March.

CHILE: Magellanes, Punta Arenas, *R. Thaxter F. H. 14*, type (Farlow).

3. GAUTIERIA GRAVEOLENS Vittadini, Monogr. Tuberac. 27. 1831; Tulasne, Fung. Hypog. 63. 1851; Corda, Icones Fung. **6**: 34. 1854; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2. **1**: 873–874. 1883; Quélet, Ench. Fung. 250. 1886; DeToni in Sacc. Syll. Fung. **7**: 178. 1888; Hesse, Hypog. Deutschl. **1**: 106–108. 1891; Bucholtz, Матеріалы къ морфологіи и систематикѣ подземныхъ грибовъ . . . Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ С. Михайловскомъ Московской губ. **1**: 146. 1902 [often cited as Beitr. Morph. Syst. Hypog.].

Illustrations: Bucholtz, *l. c. pl. 3, f. 14; pl. 4, f. 21;* Corda, Icones Fung. **6**: *pl. 7, f. 63;* Fitzpatrick, Ann. Myc. **11**: *pl. 4, f. 11; pl. 7, f. 30–37;* Hesse, Hypog. Deutschl. **1**: *pl. 2, f. 5–9; pl. 7, f. 4–6;* Vittadini, Monogr. Tuberac. *pl. 4, f. 3.*

Type: in Saccardo Herb. at Padua, also in Tulasne Herb. in Paris.

Fructifications spherical, 1–2 cm. in diameter, light ochraceous-buff to Prout's brown; stipe slender and fragile, up to 1 cm. long, 1 mm. thick; columella frequently reaching the center of the fructification, fruticose; odor very strong, as of decaying onions; peridium thin, composed of delicate, thin-walled, loosely woven hyphae, soon rupturing and disappearing; gleba ochraceous-tawny to cinnamon-brown, cavities spherical or elongated, minute, empty; septa 40–80 μ thick, composed of small hyphae, compact; cystidia clavate to subfusiform, hyaline, often obscured by the spores; paraphyses linear, septate; basidia broadly clavate, 2-spored, 12–16 × 8–9 μ, with long, filiform sterigmata; spores ochraceous-tawny, apex rounded, mostly obovoid, pedicellate, 18–19 × 11–12 μ, often with a large oil globule, usually with 7–10 prominent, smooth striae.

Deeply buried under leaf mould. Europe and North America.

Exsiccati: Saccardo, D., Mycoth. Ital., 427; de Thümen, Mycoth. Univ., 12.
Czechoslovakia: Vysoky, Chluniec ad Seleany, *F. Bubak* (Lloyd Mus. 05859).
Austria: Tyrol, Cavelonte, *G. Bresadola*, in D. Sacc., Mycoth. Ital., 427.
Germany: Sachsen, Eisleben, *J. Kunze* (Lloyd Mus. 05916, and Mo. Bot. Gard. 5637); G. Winter in de Thümen, Mycoth. Univ., 12 (ex herb. Fuckel, Farlow, Lloyd Mus., Mo. Bot. Gard., etc.); Bayern, Erharting, *E. Soehner 866* (Soehner).
Sweden: Uppland, Flottsund i granskog, *Th. C. E. Fries*, July 20, 1902; Granebergskog, *Th. M. Fries*, Aug., 1904; Elfkarleby Laxön, *A. Zathelius*, Aug., 1891 (all in Upsala).
France: Alpes Maritimes, *Claus G. Poirault* (Paris).
Italy: Piemonte, *C. Vittadini* (Paris).
New York: Ithaca, *H. M. Fitzpatrick* (N. Y. Coll. Agr. Cornell Univ. 8450, Zeller 1535).
Michigan: Isle Royale, Rock Harbor, *C. A. Brown Fp. 301, C. A. Brown & A. H. Povah 289* (both Univ. Mich. and Zeller).

3a. var. **Otthii** (Trog) Zeller & Dodge, comb. nov.

Gautieria Otthii Trog, Naturforsch. Ges. Bern Mitt. **1857**: 43. 1857 (in Nos. 388–390) [sometimes cited as Verzeichnis Schweiz. Schwämme Nachtrag **3**: 43. 1857]; Sacc. & Sydow in Sacc. Syll. Fung. **14**: 268. 1899; Zeller & Dodge, Ann. Mo. Bot. Gard. **5**: 141. 1918.

Type: in Trog Herb. at the Bot. Inst. Bern.

Fructifications depressed-globose, up to 3 cm. in diameter when fresh, drying 1 × 2 cm., cinnamon to Sayal brown or tawny-olive when dry; stipe 2 mm. in diameter, broken off short in specimen available; columella unbranched, reaching at least one-third the height of the fructification (specimen insect-eaten at the upper portion of the columella); odor weak, unpleasant; peridium not seen; gleba cinnamon to Sayal brown, cavities labyrinthiform, empty, minute; septa 90–180 μ thick, composed of slender, highly gelified hyphae; basidia clavate, 10–14 × 6–8 μ, sterigmata short, 4-spored; spores ochraceous-tawny, apex rounded, short-pedicellate, 12–16 × 6–8 μ, with about 10 smooth striations.

Switzerland. June.

Differs from *G. graveolens* in narrower spores and unbranched columella. It may be only an immature specimen of *G. graveolens*, as in that species the immature spores are somewhat longer and narrower than mature spores.

Switzerland: Hardlisberg, *G. Otth*, type (in Trog Herb. at Bot. Inst. Bern).

4. GAUTIERIA **gautierioides** (Lloyd) Zeller & Dodge, comb. nov.

Hymenogaster Trabuti Zeller & Dodge, Ann. Mo. Bot. Gard. 5: 137–138. 1918.

Hymenogaster gautierioides Lloyd, Myc. Notes 7: 1117. 1922.

Type: in Univ. Cal. Herb. 493, Dodge Herb. 858, and Zeller Herb. 1455.

Fructifications subspherical, about 3 cm. in diameter, surface convoluted, Verona brown in preserved material; stipe slightly developed, arising from very fine, brown rhizomorphs composed of septate hyphae with prominent clamp connections; columella dendroid; peridium composed of loosely woven, large, septate hyphae with swollen cells, soon evanescent; gleba Brussels brown, cavities irregular, empty; septa hyaline, 180–240 μ thick, composed of a pseudoparenchyma of large, subspherical to polyhedral cells; cystidia subcylindric, thin-walled, 8 μ in diameter; paraphyses filiform, septate, guttulate, 3–4 μ in diameter; basidia hyaline, multi-guttulate, 25–30 × 10–16 μ, obovoid to clavate, mostly 4-spored, sterigmata stout, 5–8 μ long; spores 1–3-guttulate, cinnamon to cinnamon-buff, short-pedicellate, spherical when young, becoming ellipsoid, 16–21 × 8–10 μ, with 5–9 striations usually prominently warted.

Under *Acer, Arbutus, Quercus,* and *Sequoia.* Oregon and California. April to October.

OREGON: Benton County, Corvallis, *S. M. Zeller 2567, 2568* (Zeller).

CALIFORNIA: Santa Clara County, Aldercroft, *H. E. Parks 275, Z251* (Zeller); Call of the Wild, *H. E. Parks 274* (Zeller); Guadaloupe Mines, *H. E. Parks* (com. N. L. Gardner 493) type, *911, 952* (all Univ. Cal., Zeller, and Dodge).

GAUTIERIA RETIRUGOSA Th. M. Fries, Svensk Bot. Tidskr. 3: 271–272. 1909; Th. C. E. Fries, Ark. f. Bot. 17^9: 18. 1921.

Illustrations: Th. C. E. Fries, Ark. f. Bot. 17^9: *f. 8.*

Type: at Upsala.

Fructifications irregular, 4–5 cm. in diameter, brownish; stipe short or none; fibrils abundant, large, prominent, reddish; columella well developed, forking; peridium absent; gleba brownish, cavities large, angled or elongated, irregular, 0.5–1.5

mm. broad, empty; septa thin, 90–120 μ thick, composed of loosely woven, slender hyphae; basidia cylindrical, 2-spored; spores 15–18 × 9–11 μ, ellipsoid to obovoid with 8 striae which are less regular, being sinuous and slightly warted.

Under moss in coniferous forest. Sweden. July and August.

SWEDEN: Gotland, Vallstena, Alvenparken, *T. Vestergren*, Aug., 1897, type; Uppland, Flattsund, *Th. C. E. Fries*, July 20, 1902, *Elias Aug. Fries*, July 20, 1905 (all Upsala).

5. GAUTIERIA **caudata** (Harkness) Zeller & Dodge, comb. nov.

Hymenogaster caudatus Harkness, Proc. Cal. Acad. Sci. Bot. III. 1: 248. 1899.

Type: cotype in Dudley Herb. at Stanford.

Fructifications subspherical, roughly convoluted, up to 5 cm. in diameter, fuscous, blackish-brown in preservative, cordate, base fleshy, with a caudal appendage 1–2 cm. long and 2 mm. thick, leading from rhizomorphs; columella nearly percurrent, 2 mm. in diameter, narrow, with plate-like branches; peridium formed by gelification of what would otherwise be the hymenial layer of the external septa; gleba Benzo brown to fuscous (dry after preservative), cavities irregular, empty; septa white, broader than the cavities, 200–300 μ thick, of gelified, compact prosenchyma and rather indistinct cylindric basidia, with 2 sterigmata as long as the spores; spores narrowly ellipsoid or obovoid, 13–17.6 × 7–10 μ, pedicellate, russet, with 6–8 slightly warted, somewhat branched striations often with a spiral tendency.

Under *Sequoia* and *Quercus*, California. March to April.

The type collection consists of 3½ specimens, the largest being 24 × 32 × 37 mm. in preservative.

CALIFORNIA: Marin County, Mill Valley, *H. W. Harkness 240* cotype (Stanford); Saratoga, Boy's Outing Farm, *H. E. Parks 969*; Santa Cruz County, Brookdale, *H. E. Parks 2162* (both Univ. Cal.).

6. GAUTIERIA MORCHELLIFORMIS Vittadini, Monogr. Tuberac. 26. 1831; Tulasne, Fung. Hypog. 62. 1851; Corda, Icones Fung. 6: 34. 1854; Winter in Rabenhorst, Krypt.-Fl. Deutschl.

ed. 2. **1**: 873. 1883; DeToni in Sacc. Syll. Fung. **7**: 177–178. 1888; Hesse, Hypog. Deutschl. **1**: 109–110. 1891; Bucholtz, Материалы къ морфологіи и систематикѣ подземныхъ грибовъ . . . Издан. Естеств. Ист. Музея Графини Е. П. Шереметевой въ с. Михайловскомъ Московской Губ. **1**: 147. 1902 [often cited as Beitr. Morph. Syst. Hypog.].

Gautieria morillaeformis Quélet, Ench. Fung. 250. 1886.

Gautieria villosa Quélet, Bull. Soc. Bot. France **25**: 290. 1878 [often cited as Champ. Jura Vosges Suppl. **6**: 290. 1878]; Ench. Fung. 250. 1886; Winter in Rabenhorst, Krypt.-Fl. Deutschl. ed. 2, **1**: 873. 1883; DeToni in Sacc. Syll. Fung. **7**: 178. 1888.

Illustrations: Bucholtz, *l. c. pl. 3, f. 14;* Corda, Icones Fung. **6**: *pl. 7, f. 62;* Bail. in Nees v. Esenbeck, Th. F. L. & A. Henry, Syst. d. Pilze **2**: *pl. 27, f. 1–4;* Vittadini, Monogr. Tuberac. *pl. 3, f. 6.*

Type: location unknown to us but abundant material from Vittadini in Tulasne Herb. in Paris.

Fructifications spherical to oblong, 1–3 cm. in diameter, with a basal stalk-like, usually much-branched rhizomorph; columella rudimentary, merely a subspherical summit of the rhizomorph, from which rather thick septal plates radiate into the gleba; peridium thin in the early stages, soon evanescent; gleba ochraceous-tawny to hazel, cavities 1–6 mm. in diameter, subspherical to irregular, mostly radiating from the base; septa white when broken, stupose, about 75 μ thick; basidia about as large as the spores, hyaline, granular, 2–3-spored, sterigmata filiform, as long as the spores; cystidia in the upper cavities of the fructification, not prominent; paraphyses clavate, septate, hyaline; spores 12–24 × 8–12.5 μ, pedicellate, 1–2-guttulate, with 8–10 rather sinuous striae.

In clay soil, under hardwood trees and shrubs. Europe and United States. Spring, summer, and autumn.

Exsiccati: Roumeguère, Fung. Gall. Exsicc., 2218, under the name *G. villosa.*

Czechoslovakia: Tabor, *F. Bubak* (Lloyd Mus. 05860).

Austria: Tyrol, near Magras, *G. Bresadola,* in Roumeguère, Fung. Gall. Exsicc., 2218 (N. Y. Bot. Gard.); without locality, *G. Bresadola,* Aug., 1881, Oct., 1882 (Upsala).

FRANCE: Jura, Lepinay, *N. Patouillard*, Aug. 16 (Farlow and Lloyd Mus. 08–53); Alpes Maritimes, 1500 m., *Claus G. Poirault* (Paris); Vosges and Jura, *L. Quélet* (Cooke Herb. at Kew appearing typical but not sectioned); Doubs, Hérimoncourt, *L. Quélet*, type of *G. villosa* (Upsala).

SWITZERLAND: Bern, Faulenseewald, *Trog* (Bot. Inst. Univ. Bern).

ITALY: Trentino, Milano, *C. Vittadini* (Paris and Kew).

NEW YORK: Washington County, Hudson Falls, *S. H. Burnham* (Dodge and Zeller).

OREGON: Benton County, Corvallis, *S. M. Zeller 1969;* Hood River County, near Parkdale, *S. M. Zeller 8209* (both Zeller).

CALIFORNIA: Mariposa County, Big Tree Grove, *H. W. Harkness 113*, in part (Stanford); Santa Clara County, Guadaloupe Mines, *H. E. Parks 314, 903* (Zeller); near San Jose, *H. E. Parks* (com. N. L. Gardner 541, Zeller); Saratoga, *H. E. Parks* (Zeller 1646); Los Angeles County, Claremont, *Lois M. Clency* (com. C. G. Lloyd, Pomona Coll., Lloyd Mus. 1759, Zeller 1532).

7. GAUTIERIA TRABUTI (Chatin) Patouillard, Bull. Soc. Myc. France **13**: 203–204. 1897.

Hymenogaster Trabuti Chatin, Bull. Soc. Bot. France **38**: 64. 1891.

Illustrations: Patouillard, Bull. Soc. Myc. France **13**: *pl. 13, f. 2.*

Type: in Dodge and Zeller Herbaria, com. Mattirolo, and Patouillard Herb. at Harvard University.

Fructifications 2 cm. in diameter, spherical, convoluted, pale gray-drab in dried material, mummy-brown when moistened; stipe slightly developed, radiciform; peridium evanescent, outer hymenial layer with large spherical cells, 15–25 μ in diameter, scattered over its surface; gleba concolorous; septa hyaline, 225–275 μ, composed of small, gelified, hyaline hyphae; basidia short-clavate, 2-spored; spores ellipsoid, obtuse above, mucronate below, 12–18 × 8–10 μ, with 8–9 longitudinal striae having conical warts, especially toward the distal end.

Algeria, and Jura Mountains, France.

ALGERIA: Sidi abd el Kader, près de Blida, *Trabut*, type (Farlow, Dodge, and Zeller).

FRANCE: Jura septentrionale, montagne du Lomont, *L. Quélet* (Upsala).

8. GAUTIERIA MONTICOLA Harkness, Cal. Acad. Sci. Bull. **1**: 30. 1884; De Toni in Sacc. Syll. Fung. **7**: 178–179. 1888.

Hymenogaster monticolus Harkness, Cal. Acad. Sci. Proc. Bot. III. **1**: 249. 1899.

Type: cotype in Dudley Herb. at Stanford and in N. Y. Bot. Gard. Herb.

Fructifications irregularly lobed, nearly plane above and below, 10 cm. in diameter and about 3 cm. tall, Dresden brown to mummy-brown; sterile base not prominent, columella very slender, branching; peridium or rather the outer portion of the gleba 140–160 μ thick, composed of hyphae with greatly gelified walls enclosing dirt in the outer portion; gleba ochraceous-tawny to grayish-brown, cavities small, empty; septa 120–400 μ thick, hyaline, composed of more or less gelified hyphae parallel with the hymenial surface; basidia arising from erect, septate hyphae 16 × 6–7 μ, ovoid, mostly 2-spored, sterigmata filiform, 7–10 μ long; spores 1–several-guttulate, ochraceous-tawny, ellipsoid to obovoid, 9–13 × 6.5–8 μ, with 7–10 longitudinal or oblique striations, sometimes slightly warted.

On the ground under conifers. California. July.

The cotype, *H. W. Harkness 113,* contains a mixture of two distinct types of fructifications: one with large empty cavities with large spores seems to be *G. morchelliformis;* the other type which has been taken as the type of this species has small cavities and spores.

California: Mariposa County, Big Meadow, *W. A. Setchell* (Univ. Cal. 542, and Zeller); Big Tree Grove, *H. W. Harkness 113* [*3543*] cotype (Stanford and N. Y. Bot. Gard.); Santa Clara County, Saratoga, *Roland Rice* (com. H. E. Parks 1097, Dodge); Aldercroft, *H. E. Parks 209* (com. N. L. Gardner 544, Zeller).

9. Gautieria **mexicana** (Fischer) Zeller & Dodge, comb. nov.

Gautieria graveolens? Chatin, La Truffe, 82–83. 1892.

Gautieria graveolens var. *mexicana* Fischer in Engler & Prantl, Die Nat. Pflanzenfam. I. 1**: 305. 1899.

Illustrations: Chatin, La Truffe *pl. 15, f. 4;* Fischer in Engler & Prantl, Die Nat. Pflanzenfam. I. 1**: 304.

Type: exhibited at the exposition in Paris, 1889, exhibits from Mexico, a portion in herb. Chatin in Patouillard Herb. at Harvard Univ.

Fructifications 1–4 cm. in diameter, drying Prout's brown; columella large, penetrating the center of the fructification; peridium absent; gleba ochraceous-tawny, cavities very small;

septa about 150 μ thick, of slender gelified hyphae; spores 11–15 × 7–8 μ, with 8–10 wavy, rather warted striae.

CALIFORNIA: Guadaloupe Mines, *H. E. Parks 986* (Univ. Cal., Dodge, and Zeller). MEXICO: com. Chatin, type (Farlow).

10. GAUTIERIA **Rodwayi** (Massee) Zeller & Dodge, comb. nov.

Hymenogaster Rodwayi Massee, Kew Bull. Misc. Inf. **1898**: 126. 1898; Sacc. & Sydow in Sacc. Syll. Fung. **16**: 253. 1902; Rodway, Papers & Proc. Roy. Soc. Tasmania **1923**: 153. 1924.

Type: in Kew.

Fructifications 2–3 cm. in diameter, irregular, white, becoming dingy yellow when dry; sterile base a more or less fruticose columella which becomes dark brown at maturity; peridium duplex, the outer 60 μ composed of thick-walled, periclinal hyphae, rather loosely woven, the inner layer similar to the gleba, about 120 μ thick, of large-celled prosenchyma; gleba firm, dark brown, cavities rather minute; septa about 120 μ between hymenia, similar to the inner portion of the peridium but more completely gelified; basidia not seen, but spores in twos; spores lanceolate to narrowly obovoid-ellipsoid, acuminate to acute, the younger spores showing a short apiculus, brown, 17–21 × 7–11 μ; striae 10–12, somewhat irregular, forked and anastomosing, converging at the tip.

Among buried twigs. Tasmania, and New South Wales, Australia.

TASMANIA: *L. Rodway 116*, type (Kew); Mt. Nelson Range, *L. Rodway 1104*; McRobie's Gully, *L. Rodway 1284* (both Dodge and Zeller).

AUSTRALIA: New South Wales, Mt. Wilson, *J. B. Cleland 7*; Ryde, *J. B. Cleland 15* (both Dodge and Zeller).

11. GAUTIERIA **pallida** Harkness, sp. nov.

Hymenogaster pallidus Harkness, Proc. Cal. Acad. Sci. Bot. III. **1**: 249. 1899; *not* Berkeley & Broome, Ann. & Mag. Nat. Hist. I. **18**: 74. 1846.

Fructificationes ad 1 cm. diametro metientes, irregulariter sphericae, obscure brunneae conservata; basis sterilis pulvinata, columella non visa; peridium duplex, strato extero 160 μ crassitudine, funiculis laxe implexis, strato intero 40 μ crassitudine, hyphis periclinalibus, brunneis, septatis; gleba obscure brunnea, locellis parvis, sinuosis, vacuis; septa 140 μ crassitudine, hyphis tenuibus, gelificatis, dense contextis; basidia clavata, 12–16 × 6–7 μ; sporae ovoideo-ellipsoideae, longitudinaliter striatae, striis sublaevibus, 12–14 × 7–8 μ.

Type: in Dudley Herb. at Stanford.

Fructifications about 1 cm. in diameter, irregularly spherical, very dark brown in alcohol; sterile base pulvinate, but columella not visible; peridium duplex, the outer layer about 160 μ thick, the inner 40 μ, the outer of loosely woven strands of medium thin-walled hyphae with large air spaces, the inner of very dense strands of thick-walled, periclinal, brown, septate hyphae; gleba very dark brown, cavities small, sinuous, empty; septa 140 μ thick, composed of three layers, the inner darker brown, the outer two nearly hyaline, composed of fine, compactly woven, very gelified hyphae; basidia clavate, 12–16 × 6–7 μ, granulate; spores ovoid-ellipsoid, with 10–12 nearly smooth longitudinal striations, 12–14 × 7–8 μ.

CALIFORNIA: Santa Clara County, Saratoga, *H. E. Parks 1003, 1098* (Univ. Cal.); Los Gatos Cañon, *H. E. Parks 53* (Univ. Cal.); Marin County, Camp Taylor, *H. W. Harkness 81*, type (Stanford).

CHINA: Su-tchuen Oriental, Tchen keou tin, 1800 m., *E. P. Fargas 1566* (Farlow).

12. GAUTIERIA **mucosa** (Petri) Zeller & Dodge, comb. nov.

Hymenogaster mucosus Petri, Malpighia **14**: 130. 1900; Sacc. & Sydow in Sacc. Syll. Fung. **16**: 253. 1902.

Illustrations: Petri, Malpighia **14**: *pl. 2, f. 11, 13, 14, 16.*

Type: in Ist. Bot. Univ. Firenze.

Fructifications about 3 cm. in diameter, spherical to irregular, dark brown in alcohol, firm, surface felt-like, columella not evident in the slice available for study; peridium 280 μ thick, not separable, of large, swollen, granular hyphae 6–7 μ in diameter, more or less compact and periclinal on the outside, very loosely tangled within, imbedded in a gel; gleba very dark brown, gelified, cavities very small, labyrinthiform, radiating from the base; septa composed of colored, large, thin-walled, septate hyphae similar to the inner portion of the peridium; basidia pyriform, 2-spored, 10 × 11 μ; spores fusiform to ellipsoidal, with 4, rarely 5, striae, appearing square in optical cross-section, appendiculate, 15–17 × 8–10 μ.

Sarawak, Borneo.

The systematic position of this species is still somewhat in doubt, as we have not observed a columella and the peridium

does not seem separable. Beccari notes that the cavities appear to radiate from the base. In texture and general appearance and in the shape of the spores, there seems little resemblance to *Hymenogaster*. It is to be hoped that when more material is available from the mountains of Borneo and Java it will throw further light on this problem.

Borneo: Sarawak, *O. Beccari*, 1867, type (Ist. Bot. Univ. Firenze).

13. Gautieria **albida** (Massee & Rodway) Zeller & Dodge, comb. nov.

Hymenogaster albidus Massee & Rodway, Kew Bull. Misc. Inf. **1901**: 158. 1901; Sacc. & D. Sacc. in Sacc. Syll. Fung. **17**: 239. 1905; Rodway, Papers and Proc. Roy. Soc. Tasmania **1923**: 153. 1924.

Type: in Kew and N. Y. Bot. Gard. Herbaria.

Fructifications 1–2 cm. in diameter, irregular, dirty white; sterile base very slight or absent; peridium of densely woven hyphae, homogeneous with the gleba, with an outer layer of loosely tangled, larger hyphae, including particles of soil; gleba pinkish, becoming ochraceous-tawny on drying, cavities tortuous; basidia broadly clavate, 2–4-spored (mostly 2-spored); spores broadly ellipsoid, with 6–10 ribs, somewhat verrucose (3–4 warts per rib), 19–21 × 11–15 μ.

Tasmania: *L. Rodway 643*, type (Kew and N. Y. Bot. Gard.), *1283* (Dodge and Zeller); Hobart, *L. Rodway 1116, 085* (Lloyd Mus.).

14. Gautieria **Harknessii** Zeller & Dodge, sp. nov.

Hymenogaster Bulliardi Harkness, Proc. Cal. Acad. Sci. Bot. III. **1**: 249. 1899—*not* Vittadini, Monogr. Tuberac. 23. 1831.

Fructificationes 2.5 × 2 × 2 cm. metientes, "Prout's brown" vel "mummy-brown," pyriformes; stipites funiculique non visi; columella fruticosa, ramosa, 1 mm. diametro metiens; peridium 600 μ crassitudine, hyphis brunneis, ramosis, laxe implexis, 3–4 μ diametro, luteis cum crystallis; sub peridio stratum glebae 200 μ crassitudine, hyphis hyalinis tenuibus, dense contextis; gleba "olivaceous-black (1)" conservata, locellis vacuis, parvis; septa 200–300 μ crassitudine, hyphis tenuibus, gelificatis, dense contextis; sterigmata brevia; sporae anguste ellipsoideae vel obovoideae, 12–20 × 7–8 μ, striis 8–10, longitudinalibus, laevibus.

Type: in Dudley Herb. at Stanford.

Fructifications 2.5 × 2 × 2 cm., Prout's brown to mummy-

brown, pyriform; stipe and fibrils not seen; columella fruticose, branching, 1 mm. in diameter; peridium 600 μ thick, composed of very loosely woven, branched, brown, thin-walled hyphae 3–4 μ in diameter, occasionally encrusted with yellowish crystals; below the peridium usually a thick layer of glebal tissue 200 μ thick, composed of very slender, hyaline, compactly woven hyphae; gleba olivaceous-black (1) in alcohol, cavities empty, small; septa 200–300 μ thick, composed of slender, hyaline, gelified, closely woven hyphae; sterigmata short; spores narrowly ellipsoid or obovoid, 12–20 × 7–10 μ, longitudinally striate with 8–10 smooth ribs.

OREGON: Linn County, Roaring River Fish Hatchery, *S. M. Zeller 7793* (Zeller). CALIFORNIA: Marin County, Mt. Tamalpais, *H. W. Harkness 233*, type (Stanford).

15. GAUTIERIA PARKSIANA Zeller & Dodge in Zeller, Mycologia **14**: 196–197. 1922.

Illustrations: Zeller, Mycologia **14**: 197. *f. 5–6.* 1922.

Type: in Zeller Herb. and in Dodge Herb.

Fructifications gregarious, subspherical to irregular, 1–5 cm. in diameter, some specimens drying light ochraceous-buff to ochraceous-tawny, others drying buckthorn-brown to mummy-brown; rhizomorphs white, 1–2 mm. in diameter, usually branching from a distinct radicle; columella branched; peridium persistent, 240–420 μ thick, stupose, of very fine hyphae; gleba pinkish-brown, drying ochraceous-tawny to Dresden brown, cavities 3–4 per mm., empty, spherical to irregular; septa 65–100 μ thick, hyaline, of interwoven hyphae generally extending longitudinally; basidia clavate, arising from the trama obliquely, usually two-spored, 28–38 × 7–10 μ, hyaline, sterigmata 5–14 μ long; spores ovoid-ellipsoid, buckthorn-brown in mass, pale olivaceous under microscope, with 9–11, usually 10, striations, 7–11 × 14–19 μ.

In soil under *Heteromeles, Pseudotsuga,* and *Quercus.* Oregon and California. March to June.

OREGON: Benton County, Corvallis, *S. M. Zeller 1970, 7057* (Zeller). CALIFORNIA: Santa Clara County, Saratoga, Boy's Outing Farm, *H. E. Parks 441* type, *352, 1004*; Guadaloupe Mines, *H. E. Parks 415 (Z5)*; also without locality and one unnumbered specimen, *H. E. Parks 593* (all Univ. Cal.).

EXPLANATION OF PLATE

PLATE 18

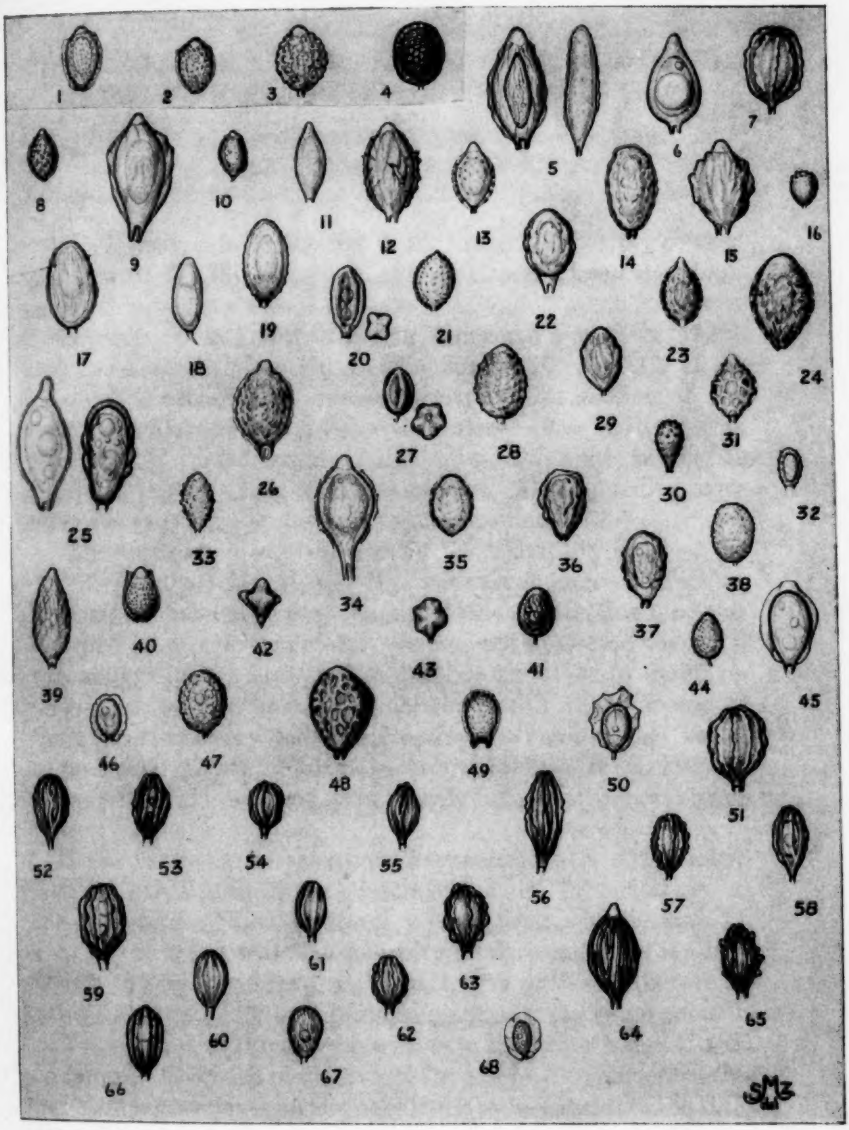
Illustrations of spores of *Hymenogaster*, *Eichoniella*, *Dendrogaster*, and *Gautieria*. In parenthesis are given briefly the material from which the drawings were made. All drawings are on the same scale (× 500).

Fig. 1. *Hymenogaster albellus* Massee & Rodway (Type, *Rodway 117*).
Fig. 2. *H. albus* (Klotz.) Berkeley & Broome (Type, *J. D. Hooker*).
Fig. 3. *H. arenarius* Tulasne (*Tulasne*, July, 1845).
Fig. 4. *H. atratus* (Rodway) Zeller & Dodge (Type, *Rodway 1265*).
Fig. 5. *H. Boozeri* Zeller & Dodge (Type, *Boozer*, in Zeller 2286).
Fig. 6. *H. Bulliardi* Vitt. (*C. Vittadini*, Milano, Italy).
Fig. 7. *H. caerulescens* Soehner (*Soehner 613*).
Fig. 8. *H. cerebellum* Cavara (Type, *Cavara*, Fung. Longobard., 109).
Fig. 9. *H. citrinus* Vitt. (*C. Vittadini*, Milano, Italy).
Fig. 10. *H. fragilis* Zeller & Dodge (Type, *Thaxter*, Chile).
Fig. 11. *H. fusisporus* (Massee & Rodway) Zeller & Dodge (Type, *Rodway 276*).
Fig. 12. *H. Gardneri* Zeller & Dodge (Type, *Gardner 89*).
Fig. 13. *H. Gilkeyae* Zeller & Dodge (Type, *Parks 983*).
Fig. 14. *H. griseus* Vitt. (*C. Vittadini*, Milano, Italy).
Fig. 15. *H. Hessei* Soehner (Type, *Hesse*, Oct. 6, 1886).
Fig. 16. *H. levisporus* Massee & Rodway (Type, *Rodway 653*).
Fig. 17. *H. lilacinus* Tulasne (Type, *Tulasne*, Oct., 1843).
Fig. 18. *H. luteus* Vitt. (*C. Vittadini*, Milano, Italy).
Fig. 19. *H. lycoperdineus* Vitt. (*C. Vittadini*, Milano, Italy).
Fig. 20. *Gautieria mucosa* (Petri) Zeller & Dodge (Type, *O. Beccari*, Borneo).
Fig. 21. *Hymenogaster mutabilis* (Soehner) Zeller & Dodge (Type, *Soehner 703*).
Fig. 22. *H. muticus* Berkeley & Broome (*Barla*, Nice, France).
Fig. 23. *H. niveus* Vitt. (*C. Vittadini*, Milano, Italy).
Fig. 24. *H. occidentalis* Zeller & Dodge (Type, *Zeller 6814*).
Fig. 25. *H. olivaceus* Vitt. (*C. Vittadini*, Lombardia, Italy).
Fig. 26. *H. Parksii* Zeller & Dodge (Type, *Parks 950*).
Fig. 27. *H. pachydermis* Zeller & Dodge (Type, *J. C. Neill*, Nelson, New Zealand).
Fig. 28. *H. populetorum* Tulasne (Type, *Tulasne*, Oct., 1841).
Fig. 29. *H. pyriformis* Zeller & Dodge (Type, *Parks 2262*).
Fig. 30. *H. Remyi* Zeller & Dodge (Type, *M. Remy*, Briançon, France).
Fig. 31. *H. reticulatus* Zeller & Dodge (Type, *J. B. Cleland 6*, South Australia).
Fig. 32. *H. ruber* Harkness (Cotype, *Harkness 248*).
Fig. 33. *H. spictensis* Patouillard (*Patouillard*, Jura, France, Oct., 1906).
Fig. 34. *H. sulcatus* Hesse (*E. Hesse*, Stadtwald, Germany, August, 1890).
Fig. 35. *H. tener* Berkeley & Broome (*Tulasne*, Sept., 1844, type of *H. argenteus*).
Fig. 36. *H. Thwaitesii* Berkeley & Broome (Type, *G. H. K. Thwaites*, Portbury, England).
Fig. 37. *H. verrucosus* Bucholtz (Type, *Bucholtz 1283*).
Fig. 38. *H. viscidus* Massee & Rodway (Type, *Rodway 270*, Hobart, Tasmania).

Explanation of Plate

PLATE 18 (Continued)

Fig. 39. *H. vulgaris* Tulasne (Type, *Tulasne*, Apr. 17, 1846).
Fig. 40. *H. zeylanicus* Petch (Type, *Petch 4603*, Hakgala, Ceylon).
Fig. 41. *H. McMurphyi* Zeller & Dodge (Type, *McMurphy 292*).
Fig. 42. *Richoniella asterospora* (Coker & Couch) Zeller & Dodge (Type, *J. N. & Else B. Couch*, Univ. N. Car. Herb. 8271).
Fig. 43. *R. leptoniispora* (Richon) Costantin & Dufour (*M. Paneau*, Verdun, France).
Fig. 44. *Dendrogaster cambodgensis* Patouillard (Type, *M. Petelot*, Cambodia).
Fig. 45. *D. connectens* Bucholtz (Type, *Bucholtz*, Mikhailovskoe, U. S. S. R.).
Fig. 46. *D. foetidus* (Coker & Couch) Zeller & Dodge (Type, *Couch*, Univ. N. Car. Herb. *7467*).
Fig. 47. *D. major* Zeller & Dodge (Type, *J. McMurphy 281*).
Fig. 48. *D. megasporus* Zeller & Dodge (Type, *H. E. Parks 977*).
Fig. 49. *D. radiatus* (Lloyd) Zeller & Dodge (Type, *F. Eyles 2530*, Union S. Africa Dept. Agr. Myc. Herb.).
Fig. 50. *D. utriculatus* (Harkness) Zeller & Dodge (Cotype, *Harkness 244*).
Fig. 51. *Gautieria albida* (Massee & Rodway) Zeller & Dodge (Type, *Rodway 643*, Tasmania).
Fig. 52. *G. caudata* (Harkness) Zeller & Dodge (Cotype, *Harkness 240*).
Fig. 53. *G. gautierioides* (Lloyd) Zeller & Dodge (Type, *H. E. Parks*, Univ. Cal. 493).
Fig. 54. *G. graveolens* Vittadini (Type, *C. Vittadini*, Piemonte, Italy).
Fig. 55. *G. graveolens* var. *Otthii* (Trog) Zeller & Dodge (Type, *G. Otth*, Hardlisberg, Switzerland).
Fig. 56. *G. chilensis* Zeller & Dodge (Type, *Thaxter F. H. 14*, Punta Arenas, Chile).
Fig. 57. *G. mexicana* (Fischer) Zeller & Dodge (Type, *Chatin*, Mexico).
Fig. 58. *G. monticola* Harkness (Cotype, *Harkness 113*).
Fig. 59. *G. morchelliformis* Vittadini (*C. Vittadini*, Milano, Italy).
Fig. 60. *G. pallida* Harkness (Type, *Harkness 81*).
Fig. 61. *G. Parksiana* Zeller & Dodge (Type, *H. E. Parks 441*).
Fig. 62. *G. plumbea* Zeller & Dodge (Type, *J. R. Weir*, Priest River, Id.).
Fig. 63. *G. retirugosa* Th. M. Fries (Type, *T. Vestergren*, Vallstena, Sweden).
Fig. 64. *G. Rodwayi* (Massee) Zeller & Dodge (Type, *Rodway 116*, Tasmania).
Fig. 65. *G. Trabuti* (Chatin) Patouillard (Type, *Trabut*, Algeria).
Fig. 66. *G. Harknessii* Zeller & Dodge (Type, *Harkness 233*).
Fig. 67. *Dendrogaster candidus* (Harkness) Zeller & Dodge (Cotype, *Harkness 49*).
Fig. 68. *D. globosus* (Harkness) Zeller & Dodge (Cotype, *Harkness 246*).



DODGE AND ZELLER—HYMENOGASTER AND RELATED GENERA

COCKAYNE, BOSTON

PROPOSALS FOR AMENDMENT OF ARTICLE 20 OF THE INTERNATIONAL RULES OF NOMENCLATURE

CARROLL W. DODGE

Mycologist to the Missouri Botanical Garden
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I. It is moved to strike out "–32" in article 20 (f) so that it will read: (f) Fungi caeteri, 1821 (Fries, *Systema mycologicum*).

Seymour (Host Index of North American Fungi, ix. 1929) and Ramsbottom (Brit. Myc. Soc. Trans. **18**: 314-316. 1934) have called attention to the ambiguity of this section of Article 20 (Article 19 of the Brussels Rules). The writer (Ann. Myc. **27**: 157. 1929) has also called attention to this subject as it affects the standing of *Elaphomyces*. Undoubtedly many others have struggled with the same problem.

This emendation will solve or at least simplify most of the difficulties involved and is in line with much current practice. It seems probable that the framers of this section intended this interpretation and that "–32" was added editorially when it was noted that the last part containing the index to the 'Systema mycologicum' was not published until 1832. Some of those who were very active in framing the rules as they relate to the nomenclature of fungi, including the late W. G. Farlow, always took this view and have largely influenced current practice.

If one takes the alternative interpretation (e. g. Ramsbottom, *l. c.*) that most of the Discomycetes and Tremellaceae begin with 1822 (Fries, Systema mycologicum, vol. 2, part 1), etc., one is faced with the difficulty of deciding whether Persoon's 'Mycologia europaea.' 1822, was published before or after the work of Fries. Mutatis mutandis, the same problem arises in some of the other parts. On the other hand, if 1821 be taken as the point of departure for all the *Fungi caeteri*, this problem is less acute as the only work to be considered is S. F. Gray's 'Natural Arrangement of British Plants.' 1821. Ac-

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cording to a note left by the late W. G. Farlow, the mycologists active in framing the rules agreed to consider it subsequent to Fries' 'Systema mycologicum.' 1821, as no information was available at the time (and none has been found since) which would settle the question of priority between these two works.

The decade 1821-1831 was very rich in important publications in the field of mycology. In many groups in which Fries was little interested and on which he published nothing subsequent to his treatment in the 'Systema,' the work of this period is superior to that of Fries. If we accept the interpretation that the date when a genus was treated in Fries' 'Systema mycologicum,' is the date of departure for that genus, we have the anomalous situation that part of an author's work is acceptable as valid, while the work on a closely related genus is invalid, although the whole was published in the same book at the same time; e. g., Gray's treatment of *Geoglossum* in 1821 is valid but not his treatment of *Helvella* and other genera of Discomycetes, although he is more modern in his segregation of genera than was Fries, and in practice some of his generic names are in common use although Fries did not recognize them in 1822. By confining the date to 1821 we conserve the Friesian tradition and interpretation for all groups in which he showed a continuing interest and in which he has profoundly influenced mycology, while allowing the works of Gray (Discomycetes), Persoon and Link (Fungi Imperfecti), who worked with better optical equipment and published figures of microscopic detail in some cases, to be taken directly rather than through the interpretation of Fries, who never used a microscope.

It was the intention of the late A. B. Seymour and of the late Roland Thaxter, both of whom had a wide experience in the nomenclature of most groups of fungi over a period of fifty years, to offer this motion to clarify this ambiguity which was evident soon after the publication of the International Rules of Botanical Nomenclature in 1912. However, pressure of work prevented its submission in time to be placed upon the agenda at the last Congress in Cambridge, 1930, and they died

some time before the call for motions for the Congress in Amsterdam in 1935.

II. It is moved to insert the following paragraph at the end of Article 20: It is permissible to recognize the Friesian subgenera ("tribus") of *Agaricus* (Fries, Syst. Myc. 1: 1–314. 1821) as genera, citing only Fries as the author of species so long as they are retained in the genus corresponding to the "tribus" in which Fries placed them.

In the decades from 1870 to 1890, Friesian subgenera of *Agaricus* were all raised to generic rank by Quélet, Karsten, and other authors, quite blindly following the Friesian tradition. In most cases, the authors probably were unconscious that they had introduced an innovation. It is almost impossible to determine who first used a name, owing to the rarity of one work and the ephemeral nature of others. Quélet's 'Champignons du Jura et des Vosges' and its first three supplements were published in the very rare 'Mémoires de la Société d'Émulation de Montbéliard,' of which no copy is known to exist in America and the only set known to me containing these volumes is in the Bibliothèque Nationale de Paris. This work was reprinted, revised, and repaged without clear indication of the dates of issue and is known in only a few of the very large libraries of the world. The other sources for new combinations not made by Quélet, who treats the flora of a very limited region, are scattered through popular mushroom books of the period, often undated or occurring only in later editions in libraries, mostly with unsatisfactory descriptions. Karsten's 'Rysslands, Finlands och den Skandinaviska halföns Hattsvampar' 1: 1–571. 1879, although not maintaining the Friesian tradition, yields other combinations as he dealt with a somewhat different flora. Not until Cuboni & Mancini's compilation in their 'Sylloge Hymenomycetum' 1: 1–1144. 1887 [Saccardo, Syll. Fung. 5] are all the known species of the old genus *Agaricus* referred to their modern subgenera, citing Fries as the author. Since the determination of the date of the combinations produced when the old Friesian subgenera ("tribus") were raised to generic rank involves

bibliographic research out of all proportion to the importance of the matter, almost all authors dealing with Agaricaceae have consistently cited Fries only, although in none of his publications did he formally use the combination attributed to him. In much of the literature before 1870, the generic name *Agaricus* was indicated only by its initial while the subgeneric name is practically always written out in full. Even Fries practically regarded his subgenera as genera, e. g., in the individual parts of the 'Monographia,' we find titles as "Monographia Mycenarum," "Monographia Collybiarum," etc., although in the work itself he still retains the A. before the subgeneric name.

Some may suggest that if this is done, it might be done with equal propriety with segregates from other large Friesian genera such as *Hydnum, Polyporus, Peziza, Sphaeria,* etc. The cases are not altogether parallel. Segregates were not so universally recognized, nor named for the Friesian subgenera so completely. They were usually made in formal proposals by authors who realized what they were doing. They are to be found in relatively common books and periodicals where it is usually possible to determine dates with some degree of accuracy, and they were usually made much earlier.

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